

NEW ZEALAND GEOGRAPHER

THE NEW ZEALAND GEOGRAPHICAL SOCIETY

COUNCIL OF THE SOCIETY

Chairman: Mrs. J. K. Bewley

Secretary: Dr. L. L. Pownall

Editor to the Society: Mr. James W. Fox (on leave)

Councillors:

Miss A. M. Gorrie

Dr. G. R. Lewthwaite

Mr. D. I. Macdonald

Mrs. S. S. Turner

Mr. J. L. Hewland

Miss B. M. Johnston

Mr. T. E. French

Mr. R. G. Lister

OFFICERS

Treasurer: Mr. W. B. Johnston

Auditor: Mr. A. H. H. Martin

Organiser of Teaching Aids: Mr. R. G. Lister

Editor of the Record: Miss E. P. Banks

Librarian: Mr. S. S. Cameron

Assistant Librarian: Mr. R. G. Ward

EDITORIAL STAFF *New Zealand Geographer*

Acting Editor: Mr. Murray McCaskill

Assistant Editors: Miss A. M. Iverach, Dr. G. R. Lewthwaite

Editorial Assistants: Mr. H. E. Hart, Mr. G. Mackay (Cartographer)

The New Zealand Geographical Society was founded officially in Wellington in 1944, and branches were established in Christchurch, Wellington, Auckland and Dunedin. The aim of the Society is to promote and stimulate the study of geography, particularly the geography of New Zealand and the Southwest Pacific. To this end a journal, the *New Zealand Geographer*, is published twice yearly, and reports of meetings, excursions and study groups are published in the *Record of Proceedings*, also twice yearly. Contributions to these two periodicals are welcome, both from members of the Society and from others interested in geography.

MEMBERSHIP OF THE SOCIETY

Membership is open to all, and dues may be paid to branch secretaries or to the Secretary of the Society. Individuals in New Zealand pay thirty shillings per annum, *full-time* students of a recognised educational institution being granted a concession rate of fifteen shillings.

SUBSCRIPTIONS: *New Zealand Geographer* and *Record of Proceedings*

Subscriptions at the rate of thirty shillings, or five dollars, per annum are available to libraries, schools and other institutions in New Zealand and overseas.

NEW ZEALAND GEOGRAPHER

CONTENTS OF VOLUME XIV, NUMBER 1, APRIL 1958

	PAGE
Settlement in Old Samoa By R. F. Watters	1
Maori Land and Maori Population in the Far North By Roger M. Frazer	19
The Special Crop Economies of Waimea County, Nelson By E. R. Bloomfield	32
Manufacturing in Auckland: Its Origins and Growth 1840-1936 By G. J. R. Linge	47
Sandspits of the Otago Coast By Eileen L. Elliott	65
Maps of Surface Winds in New Zealand By Charles B. McIntosh	75
Geographic Notebook	82
In Our Contemporaries	87
Reviews	92

*The Society is not responsible for the opinions or statements of writers in this Journal.
All material is copyright and must not be reproduced without permission.*

Published half-yearly at the press of
WHITCOMBE AND TOMBS LTD., CHRISTCHURCH, NEW ZEALAND
by the New Zealand Geographical Society (Incorporated)

Editorial OFFICE: University of Auckland, Auckland, New Zealand.

MEMBERSHIP OF THE SOCIETY is to be obtained through the constituent branches: Annual dues *thirty shillings*. Members are entitled to receive one copy of all regular publications of the Society.

SUBSCRIPTIONS TO THE JOURNAL are accepted from libraries and other organisations in New Zealand at the annual rate of *thirty shillings*, and from both libraries and individuals overseas at the rate of *thirty shillings* in the currency of the country to which the journal is to be addressed. (*Five dollars* in the United States and Canada.)

Registered at the G.P.O. Wellington as a magazine.

GEOGRAPHIC NOTEBOOK

In this Issue	82
Plans for Power	82
Land Utilisation in New Zealand	84
Theses presented during 1957	85

IN OUR CONTEMPORARIES

1. <i>In New Zealand Journals</i>	
A Plea for Local History	By G. R. Lewthwaite 87
2. <i>In Overseas Journals</i>	
Commercial Opportunity in New Zealand Towns	By S. H. Franklin 88
Antipodean Transport—A German View	By William H. Wallace 90

REVIEWS

WILLIAM L. THOMAS JNR. (Ed.). <i>Man's Role in Changing the Face of the Earth</i>	By G. Jobberns 92
ALAN G. OGILVIE. <i>Europe and its Borderlands</i>	By L. S. Suggate 93
F. J. ORMELING. <i>The Timor Problem: A Geographical Interpretation of an Underdeveloped Island</i>	By Keith Buchanan 94
W. GORDON EAST and A. E. MOODIE (Ed.). <i>The Changing World: Studies in Political Geography</i>	By J. K. Cunningham 96
K. M. BUCHANAN and J. C. PUGH. <i>Land and People in Nigeria: The Human Geography of Nigeria and its Environmental Background</i>	By B. J. Garnier 97
S. HADEN-GUEST, J. K. WRIGHT and E. M. TECLAFF. <i>A World Geography of Forest Resources</i>	By Stewart Cameron 98
S. E. MASTERS, J. T. HOLLOWAY and P. T. MCKELVEY. <i>The National Forest Survey of New Zealand, 1955, Volume I. The Indigenous Forest Resources of New Zealand</i>	By Murray McCaskill 99
OTAGO CATCHMENT BOARD. <i>Shotover River Survey.</i> <i>Otago Catchment Board Bulletin, No. 1</i>	By D. Hamilton 101

New Zealand Geographer

VOLUME XIV

April, 1958

NUMBER 1

SETTLEMENT IN OLD SAMOA: 1840

R. F. WATTERS

THE CHARACTER of the Samoan village in 1840 expressed the social life of a resistant native culture. It was the focus and embodiment of a cultural complex, just as much as a village is in Western society, but encompassing in its island world a much greater proportion of the whole 'national' complex. This paper attempts to locate Samoan settlements in 1840, to distinguish briefly their character in time and place, and to indicate their importance in Samoan life.

The period represented by the date 1840 marks a crucial stage in the modern development of Samoa; many of the processes formulating the present physical and cultural pattern were already irresistibly under way.¹ There had been little culture-contact in the century succeeding Jacob Roggeveen's discovery of the group in 1722, but after 1830 itinerant whalers, traders and missionaries began to stamp their impress on island life. By 1840 Western economic penetration had begun, rival imperialisms were beginning to operate, and after a decade of missionary effort over half the population had become nominally Christian. The West had come to stay, Samoa's old isolation had passed irrevocably and the bases of future development were being laid down. But although the process of transformation had commenced, we may assume that the invading *papalagi*,² or white man, observed the natives living very much in traditional fashion and utilising a landscape as yet little modified by alien influences.

The Samoan group consists of the three large islands of Savai'i, Upolu, Tutuila, the small islands of Manono and Apolima which lie

¹ The date chosen represents the earliest time for which it is feasible to attempt a geographical reconstruction of primitive life and landscape; an earlier date would have narrowed too drastically the range of contemporary written material available. Some of the contemporary accounts of the group in 1839-40 are among the most thorough and penetrating in existence.

² Literally 'heaven-burster'—an appropriate name for the white man.

between Upolu and Savai'i, the Manu'a group in the east (Tau, Ofu and Olosega), Aunu'u, which lies off southeastern Tutuila, and tiny Rose Island, an atoll 150 miles east of Manu'a. The group is situated between latitudes $13^{\circ} 25'$ and $14^{\circ} 33'$ South.

PHYSICAL SETTING

Geologically, the islands are typically oceanic, the rocks being quite uniform in composition and structure. The oldest inlying Pliocene lavas, eroded into monadnock-like peaks, are almost everywhere flanked or overlain by extensive beds of younger basalts which have usually formed broad dovetailing fans of pahoe-hoe form. The terrain is characteristically rugged, for the steep central ridge varies in elevation from 2,000 to 6,000 feet, and deeply-dissected spurs often stretch to the coast. Coastal plains are generally under a mile in width, except in northwestern Upolu, where the Aana plain reaches a maximum distance of four miles inland.

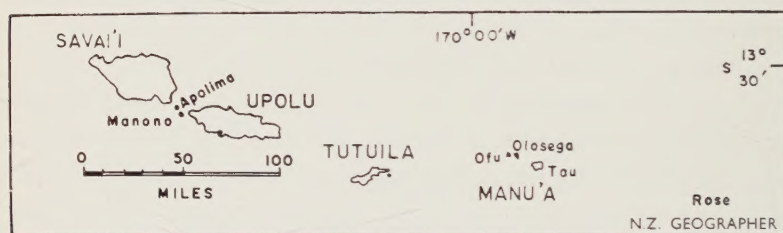


Fig. 1. The Samoan Group

Samoa experiences an oceanic mesothermal climate, and rainfall varies from 180 inches at Poutasi on the wet southeastern side of Upolu to over 400 inches in mountainous Savai'i, and to only 90 inches in northwestern Savai'i (Falealupo). Considerable run-off occurs, but much of it is underground, for Samoan lavas are extremely permeable. Thus stream volumes are characteristically small except after torrential rainfall.

The youthful nature of the lava is reflected in the characteristic immaturity of many Samoan soils. Laterisation has proceeded far only in soils derived from the older rocks in the wetter uplands, where strong profile development, excessive acidity in upper levels, and leaching of silica to the C horizon often occur. But most soils are characteristically immature, with only moderate profile development and open texture; moderate to abundant supplies of plant nutrients

are still retained. Stoniness has always been a limiting factor to cultivators of these yellow-brown clay loams.

In 1840 the dense enveloping forest mantled practically all slopes from shore to mountain top, different associations of plants and different forest structures distinguishing the strand and lowland forest zones and the higher middle and upper forest zones.

DISTRIBUTION OF POPULATION

Samoa's population of about 54,000³ lived in villages that consisted generally of several 'sections' or separate units, linked together by blood ties and social, economic and political relationships. Krämer,⁴ the most thorough student of the Samoan village, records many comprising anything up to seven sections. Many sections possessed high social status and fulfilled roles in the combined village to an extent out of all proportion to their size or resources. The possession of a *fa'alupega*, (a ceremonial greeting form which compressed local history, the order of precedence, the authority of hereditary rank and various prestige concepts) was necessary for a group of combined sections to be regarded as a 'village'. As sections formed separate physical entities in the landscape, each with its separate group of inhabitants, they have been chosen as the units of settlement and of population distribution.

As Figures 2, 3 and 4 record, Samoa in 1840 had an estimated total of 298 settlements, of which Savai'i had 103, Upolu 120, Tutuila 56, and Manu'a 19. The settlements on Manono and Apolima in 1840 are not known.⁵ Population was overwhelmingly concentrated on the coasts, 52,000 or 96 percent of the population living within a mile of the sea. Other noticeable features of the distribution pattern are concentrations of population in northwestern Upolu, in the Aleipata area in eastern Upolu, around Safata in the southwest, a strip in southeastern Upolu, the Safune-Matautu area in northern Savai'i, and the Leone plain of southwest Tutuila.

The role of the sea in Samoan life was the most important reason

³ See C. Wilkes: *Narrative of the United States Exploring Expedition during the Years 1838-42*, Philadelphia, 1845, Vol. II, pp. 106-107; also the London Missionary Society census, noted in J. B. Stair: *Old Samoa*, London, 1887, p. 58.

⁴ A. Krämer: *Die Samoa-Inseln*, Stuttgart, 1902, Vol. I. The information for Figures 2, 3, and 4 was gained mainly from the extensive survey of Krämer. Modifications have been made as a result of correlation of evidence produced by other reliable writers, such as Stair, *op. cit.*, G. Turner: *Nineteen Years in Polynesia*, London, 1881; R. W. Williamson: *Essays in Polynesian Ethnology*, Cambridge, 1939; M. Mead: *The Social Organisation of the Manu'a*, *Bernice P. Bishop Mus. Pub. No. 76*, Honolulu, 1930; and F. M. Keesing: *Modern Samoa, its Government and Changing Life*, London, 1934.

⁵ Evidence is incomplete in early accounts and maps.

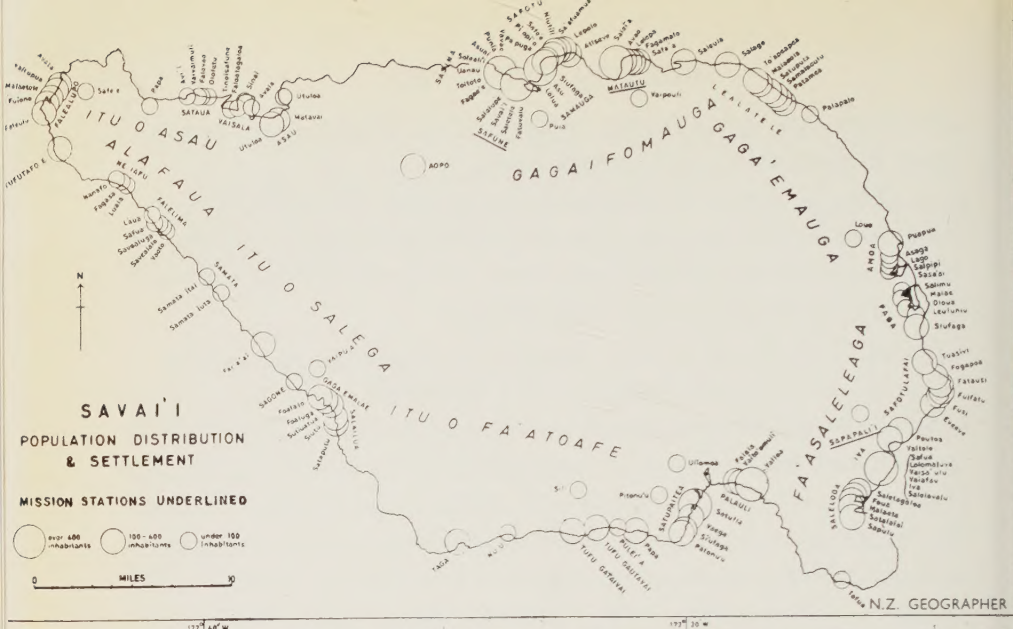


Fig. 2. The distribution of population on the Island of Savai'i

for this distribution pattern. Fishing was a vital activity in Old Samoa, ranking in economic importance after gardening, for fish were eaten every day in each household. From the lagoon such fish as the migratory mullet and mackerel and the marine worm *palolo* were caught by a variety of methods. From the reef, women collected shell fish or fished with rods. On the open sea, men chased shark and the prized *bonito*. Inside the reef, many canoes passed frequently between neighbouring villages. Across the sea and through the reef channels inter-island trade and gift exchanges were carried on.

The importance of the location of reef channels in influencing coastal settlement is indicated by the fact that of the settlements recorded at least 157, or 53 percent, lay within three miles of reef channels. Most of these settlements were at river mouths.⁶ Undoubtedly the number of reef channels occurring near settlements was higher. It has not been possible to locate those which would be navigable to native canoes but were ignored by surveyors on account of their tortuous, narrow or shallow passages. The settlements located near reef channels included practically all the largest, richest and socially most important

⁶ Krämer: *op. cit.*, Vol. I, pp. 42-327; H. I. Stearns: 'Geology of the Samoan Islands', *Bull. Geol. Soc. America*, No. 55, 1944, (especially the map of Tutuila); and various charts and maps, especially the Admiralty Chart of the Samoan or Navigator Isles (1: 446, 400), from German and U. S. Govt. Charts to 1929, with additions and corrections to 1951; German Govt. Survey Plans of Savai'i (1: 150,000), 1912, and Upolu (1: 100,000), 1913; U. S. Govt. Chart, Fagaloa Bay, (1: 12,000) 1942; U. S. Govt. Chart, Saluafata Bay, (1: 12,100) 1924.

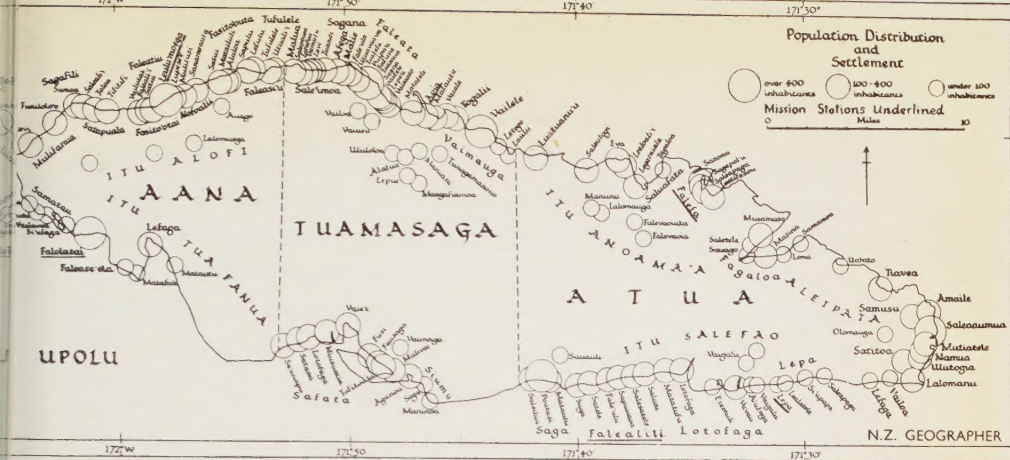


Fig. 3. The distribution of population on the island of Upolu

settlements of Old Samoa. At least 70 percent of the population, or 61 percent of coastal settlements, was located within three miles of a reef channel. In Savai'i, 58 out of a total of 103 settlements (56 percent) had a reef gap within three miles, most of the others lying on an ironbound coast. Of Upolu's 118 settlements, 97 (82 percent) were similarly situated near reef gaps. Owing to insufficient evidence, the list of channels is far from complete in Tutuila and the Manu'a group. At least fourteen settlements in Tutuila lay within three miles of a reef gap.

The economic importance of channels is expressed in the name of a village at the western extremity of Upolu—Mulifanua, which means 'hinterland'. The channel of the village did indeed act as a door, opening the trade of part of the surrounding area of the Aana district, the most productive region of Old Samoa.

Another feature which appeared to have some bearing on the location of settlement was the presence of coral reefs. Not only did these give shelter but they afforded valuable seafood in the lagoons and reef pools. Settlements were few and small on the exposed coasts, in contrast to the numerous populous settlements that lined sheltered lagoons. The most densely populated stretch of coast in Tutuila and Upolu lined a broad productive lagoon protected by a channel-cut reef.

An overwhelming proportion of the population lived on level or gently-sloping land, which is to be found almost solely along the coast. The largest plain in the group reaches the sea in the Aana district of northwest Upolu, and its northern fringe was the most densely settled area of Old Samoa. Of the various concentrations of population listed above, five were located around bays with gently sloping land at their heads. Elsewhere, the Samoan settlement was invariably located on

only a few scattered settlements. Inland, the older rocks (Middle Quaternary or Pliocene lavas) produced more acidic soils, in which stronger leaching had occurred to levels below the root zone. The more compact texture would be less satisfactory for the growth of the staple tubers, taro, *ta'amu* and yam.

Another significant factor in the distribution of population was water supply. Underground drainage through excessively porous basaltic lavas leaves many inland areas arid, and subterranean streams came to the surface as springs at base level—near the beach, or perhaps in the lagoon. It has not been possible to locate all springs, or to determine the nature of the water supply for each of the 298 settlements. It has been found, however, that at least 97 settlements in the two major islands had springs, of which 38 were on Savai'i and 59 on Upolu. Many smaller springs undoubtedly existed, but have not been recorded.

At least 24 settlements on Upolu had river water for their supply, while only two are known definitely to have used streams on Savai'i. Inland, the deeply-cut gorges in which the young surface streams flowed often made it difficult to obtain fresh water; this must have encouraged settlement by the coastal springs.

The conclusion to be drawn from the distribution of population and of settlement sites is clear. Settlement was based almost entirely on the coast, only four percent of the population and 14 percent of settlement sites being inland.¹⁰ Moreover most of the inland settlements were little more than a mile from the sea. The optimum position was *i tai* (towards the sea); *i uta* (inland) was less desirable from nearly all points of view, for there were the places of 'drudgery' and of 'low esteem'.¹¹ The inland trail marked a road to a world haunted by demons, a world inferior to that which beckoned through reef entrance and across the lagoon. Villages 'faced' the sea, the source of so much of their food and resources, the highway of their traffic, the scene of the legendary voyages of their ancestors. Here was the spring of so much of their tradition, and the pathway into which leapt the

¹⁰ Motives for inland settlement were often connected with the desire to trade with 'partner' settlements on the coast, supplying them with such products as pigs, pigeons, parakeet feathers, the small river fish *igaga*, and various resources of the middle forest zone. The pressure of a rising population may have led to the departure of newly-married couples to an inland hamlet to cultivate hill slopes perhaps unwanted by relatives. Blood ties established a continuing link between coast and hinterland. The exhaustion of overworked coastal soils and the suitability of inland slopes may have led to inland settlement. Many inland settlements were fortresses. According to Manu'an tradition, all people once lived inland through fear of their enemies; only 'since the coming of the light' have people moved to the coast.

¹¹ See Mead: *op. cit.*, pp. 49-50.

souls of their dead on their voyage to the underworld. Moreover, in 1840, the sea was the road on which the white man was bringing his all-pervasive and desirable civilisation.

THE VILLAGE

The Samoan village was generally an aggregation of several separate hamlets or sections, comprising in all about fifty buildings, inhabited by about two hundred people. These people were bound together by family ties in a communal life, possessed local economic interests, and together constituted Samoa's smallest but most stable political unit. Whether the characteristic settlement was a true village, or just an autonomous village section, it remains geographically a unit, with a structure that was an important feature in the landscape.

Physically the village consisted of scattered groups of thatched huts covering the *faga*—dwellings, cook-houses, canoe-shelters, chicken-houses, and fishing huts. These buildings were irregularly divided by black stone walls and sapling fences that served to ward off pigs, or were separated by bare ground, and surmounted by the dominant domed roof of the guesthouse on the central village green or *malae*.

Villages or village sections contained one or many families living together. A modern observer in American Samoa estimates that most villages comprise five to twenty-five families¹²—a number that is also applicable to Samoa in 1840. Each family group (*aiga*) comprised anything from ten to fifty closely-related people, making a complete unit under the headship of the *matai*.

In the centre of the strung-out group of huts lay the village green. Normally the property of a high chief, it varied in area from a small green to a large area, most commonly several acres in extent.¹³ Usually kept very clean, and often of even surface, it was also the meeting-place of the village council (*fono*), the site of wedding feasts, triumphal shark processions, and enthralling night dances. Here criminals were tried and sentenced, and gift-exchanges hedged about with elaborate ceremonial took place. At most times it provided sunny space on which pandanus leaves were laid out to dry. But although it was important as a physical feature, and possessed many social functions,

¹² J. W. Coulter: 'Land Utilisation in American Samoa', *Bernice P. Bishop Mus. Bull.*, No. 170, Honolulu, 1941, p. 22.

¹³ Mead: *op. cit.*, p. 71.

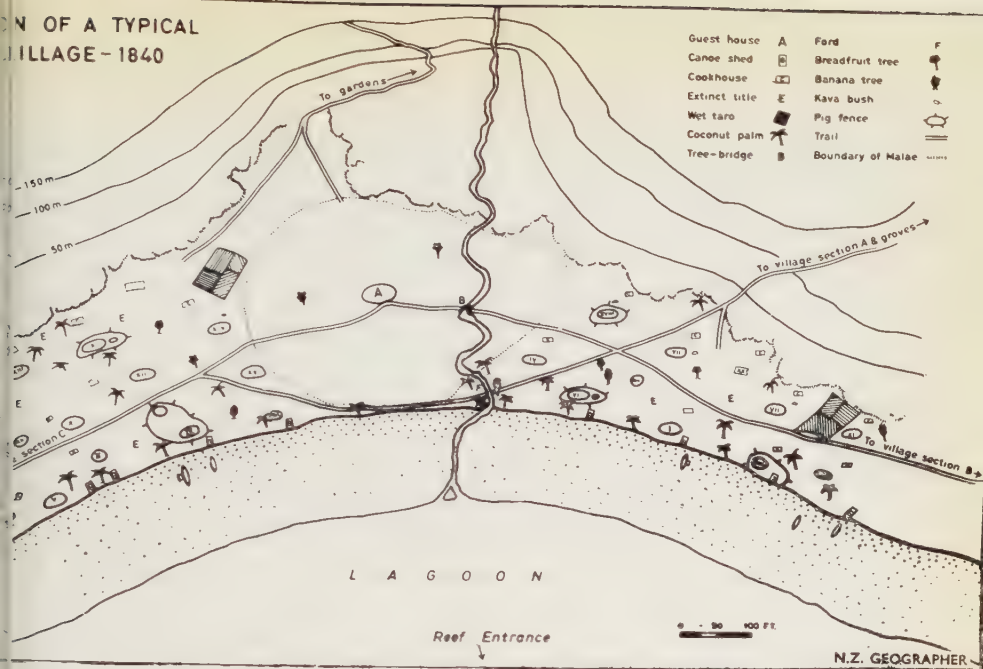


Fig. 5. Plan of a typical village settlement

the *malae* kept only 'a shadow of the prestige and none of the sanctity of the *marae* of South East Polynesia'.¹⁴

Behind the elongated string of *fale* flanking the *malae* and hugging the beach, lay the cookhouse. Unobtrusively located, often amid vegetation, this small *fale umu* was a simple shack, roofed with palm-leaf mats and containing a circular oven of stones above four supporting pillars.¹⁵

On the edge of the beach, any voyaging double-canoes, or perhaps the valuable *bonito* canoes (*va'aalo*), lay under the protection of low coarsely-thatched shelters. *Bonito* canoes or one-man dugouts (*papoao*) were sometimes kept at the end of houses, although often they lay scattered on the beach, covered only with palm leaves. In 1840 dugout canoes could sometimes be seen on the beaches raised on trestles, holding pools of coconut oil, Samoa's first important commercial product.

Before the coming of the white men every village had a *falacitu* or spirit-house. Built in the common circular or elliptical style, it had nothing in its appearance to distinguish it from the ordinary house, the veneration of the natives being the only external sign of its existence. It functioned in 1840 in less than half of Samoa's settlements, that is in the more isolated, non-Christian ones.

¹⁴ Mead: *loc. cit.*

¹⁵ T. Nightingale: *Oceanic Sketches*, London, 1835, p. 85.

A few broadly-spreading breadfruit trees invariably grew between the huts, while dotted here and there would be a few *kava* (*Piper methysticum*) and *hala* (pandanus) bushes, some bananas and ornamental shrubs. Small patches of taro—often of wet cultivation on the coast could generally be seen. Such crop patches ranged from a few square feet to a hundred square yards. The small areas of unutilised land between all these features were invariably named, and represented the sites of extinct titles, spots haunted by uneasy spirits, or land earmarked as future house sites. The entire scene, in spite of its scattered and varied nature, had an order impressed upon it by the pride of the Samoan in his home. This showed in the cleanliness of the stone terraces of houses, the scrupulous neatness of the *malae*, the well-weeded plots and tidy paths. Such neatness is often not present today, suggesting possibly a decline in group prestige or a slight loss of local pride as a result of acculturation.

Well-trodden trails led off through groves of coconuts to the gardens on the slopes behind. High amid the background of the scene, in the dense enclosing forest, these gardens lay, ladang fashion, in burnt-out clearings. These were the *vai'fanua* or main taro lands, and formed the most inland parts of the village. Lastly, giving a semblance of unity to the whole village scene from the inland trails to the canoes at the edge of the lagoon, grew the ubiquitous coconut tree, giving shade to all and providing a wider range of products than any other plant.

HOUSE TYPES

The most conspicuous features of the settlement were of course the houses (*fale*). These appeared as heavily-thatched, domed roofs supported by posts projecting above stone terraces, with the interior open to view when the plaited wall screens were raised during the day. Three types of houses were built: the elliptical or 'long house,' the round house, and the rectangular type. Most villages had combinations of the elliptical and round houses, with the former being the more common.¹⁶ Sometimes villages had combinations of all three types in varying proportions. In some settlements of high prestige, the dwellings were slightly larger than in others.¹⁷ All three types are shown in the sketched typical village scene, Figure 6.

¹⁶ Stair: *op. cit.* p. 105; P. H. Buck: 'Samoan Material Culture', *Bernice P. Bishop Mus. Bull.*, 75, Honolulu, 1930, pp. 6 and 142.

¹⁷ T. M. Hood: *Notes of a Cruise in H.M.S. Fawn*, 1863, p. 65.

Sketched
Conflation:
B. H. Watters.



Fig. 6. A Samoan village, showing round, rectangular and elliptic *fale*, with a taro pond in the foreground

The elliptical house could be as large as thirty-five feet in maximum diameter, a hundred feet in circumference, and about twenty-five feet high,¹⁸ although the average was probably a little smaller than this. Three massive central posts about twenty-five feet high supported a ridge pole. Cross-beams lashed to the central posts at different heights connected them to the conical roof. Rafters, straight in the centre, but curved at the ends of the house, were lashed to these to give the required round shape. Wall posts three feet apart and four feet high were placed in elliptical fashion and connected by a curving wall plate. To this the rafters were lashed so that the eaves projected about a foot. The durable breadfruit timber was used for posts and the light hibiscus or cocunut timber for rafters. The floor consisted of a paved platform made of small oval stones. The whole interior was kept clean, except for the sootiness caused by the two fire places. Coarse coconut-frond mats covered the stone floor and finer pandanus or hibiscus mats, utensils, a kava bowl, a few weapons and perhaps a prized canoe completed the interior scene.

The round house was also the dwelling of a *matai* of some wealth, for this style was considered as worthy as the elliptical. It had differences and deficiencies in its construction compared with the true round house of the South Island of New Zealand.

The simple rectangular house, considered the meanest of the three, was apparently derived originally from East Polynesia through

¹⁸ Turner: *op. cit.*, p. 153.



Photo:
Krämer

Fig. 7. A typical view of the cen a settlement showing elliptical *fale*

Tonga¹⁹. This type was the home of poorer people. Many simpler variants of the style were built: half and double-sided fishing huts (*faleapi*), shelters near gardens, cook-houses, work-houses and canoe-houses. Temporary forest houses (*falevao*) were built with simple saddle-roofs.

Near the centre of the settlement stood the guest-house (*fale-tele*), usually on the *malae*. This masterpiece of Samoan craftsmanship was frequently fifty feet long, twenty feet broad and thirty feet high.²⁰ Built of the finest materials by the skilful guild of house-builders, the *fale-tele* was worthy of its dignified place in the social and political life of the village. This was the high chief's occasional residence, the dwelling in which guests resided, the scene of the deliberations of the *fono*, and the centre and culmination of ceremonial worthy of the village gods and heroic ancestors. In contrast to the ordinary *fale*, which nestled among the trees, the *fale-tele* usually stood out boldly on the *malae*, its roof more dome-like, its thatching more intricate, its pillars more massive.²¹ In some villages of 1840 it was, in addition, the temporary chapel of the new *lotu*, the wonderful new religion the *papalagi* had brought with him.²² Where a village of high esteem had more than one guest-house, the one on the *malae* held premier place.

¹⁹ This conclusion, supported by Wilkes's view (*op. cit.*, Vol. II, p. 145), reconciles Buck's contention (*op. cit.*, p. 166) that the rectangular house was borrowed from East Polynesia with Stair's claim (*op. cit.*, p. 105) that it was modelled on the Tongan house. The Tongan route was commonly followed in communication with East Polynesia.

²⁰ Sometimes a round *fale-tele* was built.

²¹ Often representing in number the titles the village held. Mead: *op. cit.*, p. 49.

²² Wilkes: *op. cit.*, Vol. II, p. 74.



Fig. 8. A missionary's house. (Early print by an unknown artist)

Apart from being prominent cultural phenomena in the landscape, Samoan houses were distinctive in many ways. While there is little evidence suggesting that combinations of house-types or slight variations in each type varied significantly throughout the group, it is probable that those settlements that stood highest in prestige had the most elaborate *fale-tele*, and probably few rectangular houses. These perhaps occurred mainly in those southern coastal villages that had once been noted for their trading voyages to Tonga and the east. But there is no doubt that Samoan house-types were distinctive in Polynesia. One early observer found that Samoan houses 'differ materially in shape and construction from any we have before seen';²³ while Wilkes believed that house-building displayed the Samoan's greatest ingenuity.²⁴ Rounded apses, intricate curving framework and various details such as the local intricacy of thatching, ingenious jointing, style of ornamental lashings and the way the framework hung on the king post gave Samoa an individuality of its own.²⁵

THE SETTLEMENT PLAN

The morphology of Samoan settlement was relatively simple and uniform.²⁶ It differed only in details from the settlement forms of other primitive peoples with a similar sea-based culture. Most settlements

²³ G. M. Colvocoresses: *Four Years in a Government Exploring Expedition*, New York, 1852, p. 81.

²⁴ Wilkes: *op. cit.*, Vol. II, p. 145.

²⁵ E. G. Burrows: 'Western Polynesia: A Study in Cultural Differentiation', *Etnologiska Studier*, Göttingen, 1938, p. 33. See also E. G. Burrows: 'Culture areas in Polynesia', *Journ. Polyn. Soc.*, Vol. 49, 1940.

²⁶ See Fig. 6. This is a conflation of evidence provided by many authorities.

were sprawled out in dispersed ribbon fashion. Many of them were up to three quarters of a mile in length, although the largest had a population of under five hundred. Krämer records one which took half-an-hour to walk through.²⁷ Even the smallest hamlets often stretched two hundred yards between the extremities. Huts of one type or another generally ran in single or double line along the beach.

The reasons for such a ribbon form are obvious: population growth led to expansion in the most natural way for a society so greatly based on the sea. Rugged topography and the general lack of coastal plains left only a thin ribbon of beach and calcareous sandy alluvium or shallow valley floor between the water and the steep slopes. The elongated form increased the tendency to 'splinter' into separate village sections.

INLAND SETTLEMENTS

The social and economic independence of the households expressed itself in the wide spacing of dwellings. The apparently haphazard spacing of houses gave no clue that the family chiefs in the village council discussed the siting of houses. Knowledge of local siting factors, land-ownership boundaries, and human whim seem largely to have determined the pattern. While the ground plan of settlements was generally defined by cliffs behind and sea before, a few instances of agglomerated settlement do occur. Vaimosa, near Apia, is described by Krämer as being consolidated in form,²⁸ although it is not certain that this was the case in 1840 before white penetration set in train new tendencies. The inland village of Amoa, in Savai'i, was certainly agglomerated, Krämer describing the huts as lying 'circlewise' about the *malae*.²⁹ Confined bays, also, led to a certain consolidation, especially in parts of Tutuila and Manu'a where cliffs often fall sheer into the sea enclosing in coves small pockets of sand.³⁰ Other inland settlements presumably followed a similar pattern since a concentrated area for a settlement site was easier to keep clear of forest regeneration. Moreover, the conditions encouraging ribbon development did not occur inland, except along streams or trails, as in the case of the Aana trail from Falclatai to Fasito'aotai, a distance of about ten miles.³¹

²⁷ Fasito'outa in Aana (Krämer, *op. cit.*, Vol. I, p. 154).

²⁸ Krämer: *op. cit.*, Vol. I, p. 54.

²⁹ *ibid.*, p. 63.

³⁰ Mead: *op. cit.*, p. 45.

³¹ Stair: *op. cit.*, p. 57.

In 1840, between thirty and forty white residents were living in Samoa. Some were British and American runaway sailors, interested in acting as agents and interpreters for supplying visiting vessels with fresh pork, vegetables and water, or seeking coconut-oil from the natives. Most whites were established at Apia, which was potentially the most valuable port. These first traders built their dwellings and store sheds close to the landing place of the bay. While some white settlers lived in native huts, or modified *fale*, most appear to have built separate shacks. A few other runaways who lived in more isolated parts are mentioned in the letters of missionaries.

EARLY MISSIONARY HOUSE TYPES

The more permanent settlers, the missionaries, were located in the settlements indicated in Figures 2, 3, 4. Figure 8 shows one of their houses in a typical setting. These dwellings were nearly always adaptations of the Victorian-English cottage style, usually comprising three rooms. Roofs were thatched in native fashion, and many windows were included, but otherwise European housing conceptions were preserved, with no regard for local conditions. The whitewashed, coral-plastered cottages were soundly built by the practical missionaries and transitory whites, for they were sufficiently strong to resist hurricanes.³² Joinery was done in English style using indigenous timbers,³³ while shutters and other fittings were imported from overseas. Essentially experimental, these houses were later replaced by roomy dwellings with verandahs.

All churches in 1840 appear to have been large native houses built in the elliptical form. Leone had a very large temporary chapel of native style. Soon after 1840 two churches of European style were built in Apia, complete with masonry and shingled roofs. In 1844 many buildings were built at Malua where the London Missionary Society founded their institution for native teachers. At about the same time white chapels of coral, similar in style to the missionaries' houses, began to be built. Ugly European edifices, grog-houses and trading sheds, soon lined Apia's foreshore. Western influences were to produce a greater concentration of settlement and slight nucleation in the centre before white settlers eventually gained possession of the whole town and largely supplanted its native character.

³² W. B. Churchward: *My Consulate in Samoa*, London, 1887, p. 22.

³³ J. Erskine: *Journal of a Cruise among Islands of the Western Pacific*, in *H.M.S. Havannah*, London, 1853, p. 47.

Houses early acquired a monetary value with the introduction of a Western currency system. In 1849, a Samoan elliptical house 'of tolerable dimensions' would cost a white man two hundred dollars, a higher price no doubt than would be charged in 1840.

VILLAGE FUNCTIONS

To the Samoan of old, the village was the centre of his existence, and a large part of his universe. He thought first and foremost of his village, then of his district and island, and only lastly of Samoa. Villages of relatives were friendly places where the Samoan could live in comfort. In all other villages he felt an alien, and would venture there in friendliness only in a *malaga* or travelling party, when he was fortified by the numbers of his fellow travellers and by the knowledge that he was 'taking his village with him'.³⁴

Besides being autonomous in all local matters, villages carried varying weight in sub-district and district councils according to their established political power. In war as well as peace certain functions had to be performed: some 'privileged' villages led the district in war (*itu'au* or *mua au*), others formed the main body (*lotoalo*), while others constituted the *muriau*, or rearguard. Some villages traditionally furnished several fighting canoes, others contributed arms. An *alataua* village was important, for it possessed oracular functions and preserved the traditions and genealogies of the district or sub-district. Certain villages were the recognised capitals of districts and sub-districts, bearing the titles of *Laumua* and *Tumua*, denoting their primacy. Such places would have *malaes* and *fale-tele*s of the highest prestige and there the paramount chiefs and orators would play leading parts in the elaborate discussions of district or sub-district assemblies.

Material factors in the local environment also contributed to village individuality. Size, easy accessibility by reef entrance, value of fishing grounds, depth of soil, abundance of water-supply, effectiveness of natural drainage, and favourable surface configuration all helped to give weight to the character of a village. Economic and personal factors, too, played their part—for example, village prowess in *bonito* fishing or *palolo* catching, or the skill of women in making fine mats and the craft

³⁴ This function of village settlements in Samoan life sprang largely from their individuality. Little though settlements varied in material form, their nebulous characters did differentiate them (and their related sub-regions) from one another. Every village inhabitant was acutely conscious of the make-up of the village individuality: the special prerogatives, formalities, and prohibitions surrounding the village titles, the order of precedence over other villages and method of address to them, and the village demons and guardian spirits that were ever present.

of the men displayed in house-building or canoe-making. An enviable reputation was accorded the village of a famous specialist in tattooing or maker of kava bowls. Individuality of villages also stemmed from the productivity of the ancestor-guarded taro lands, the area of coconut groves, the possession of voyaging double-canoes and the skill or daring with which they were used in trading expeditions.

An important function of settlements was to provide through the village organisation the ceremonial and communal framework of economic activities. The extensive planting of taro gardens by the young men's guild (*aumaga*), the organisation of pig hunts or shark catching, or the planning of fish drives were communal undertakings by a combination of households.

While little competition existed between individual specialist craftsmen, villages competed against each other in the size, quality and value of their gift. A gift exchange provided encouragement for more thorough utilisation of local resources and stimulated production. Thus a vital function of village settlement was the provision of social cohesion, an important factor in giving regional unity and enabling Samoan society to resist the disintegrating influences which accompanied Western penetration.

CONCLUSION

The effect of village social organisation on Samoan culture seems in some respects to have been restrictive, for rigid concepts held all forms of cultivation and craft production in shackling social bonds. It confined all activities within a well-recognised pattern, conformity to which meant material prosperity, enviable social status, and elaborate ritual respect. Since food and other resources were gained more easily than in most other Pacific island groups, and the pressure of population was not great, less effort was required to maintain a comfortable level of subsistence. The challenge of the natural environment was only slight, and the response of Samoan culture was accordingly small. For example, Samoans knew of the existence of irrigation and terracing practices in various island groups, but they were not employed in Old Samoa.

Social cohesion does not appear to have been seriously threatened in Samoa in 1840, as it was in similar periods in Fiji and Hawaii. Samoan society proved itself more stable and more resistant to tendencies leading to disintegration largely because of the solid stability that village settlements in their varied functions gave to Samoan life.

Although economic and religious forces attracting Samoans to areas of white influence were operating as early as 1840, such a well-organised and self-sufficient village system stood firm, presenting a character uncorrupted and distinctive in Polynesia, and surviving in considerable measure to characterise the Samoa of today.

MAORI LAND AND MAORI POPULATION IN THE FAR NORTH

ROGER M. FRAZER

THE DISTINCTIVE problems of Maori population and Maori land in the far north of New Zealand have so far received little investigation. Despite a high birth rate and a falling death rate, Maori numbers are growing but slowly, and in Hokianga and Whangaroa counties are actually decreasing; outward migration is increasingly apparent and in many settlements poverty is obvious. Many persons claim that the reason is to be found in the failure of the Maori to use his land properly, and point to the neglected condition of large areas of undeveloped and unoccupied Maori land as the main feature retarding local progress. Complaints are heard that the poor condition of the roads is due to non-payment of Maori rates and that the pakeha taxpayers' money is being used to develop land at high cost which immediately reverts to scrub and waste when the Maori regains control. The Maori repudiates many of these charges, claiming that the pakeha gained control of almost all the good land, and that the remaining undeveloped Maori lands are almost worthless. Furthermore the Maori are more numerous than the pakeha in most rural areas, and yet the former have much less land. Farms are too small to support families, and young people, who can find no work, are forced to migrate to the towns where living conditions are often poor.

These charges and counter-charges could be continued indefinitely but they are sufficient to suggest that a considerable problem exists. In this paper the problem is analysed in the four northernmost counties of Northland—Mangonui, Whangaroa, Hokianga and the Bay of Islands—where the Maori population is greatest and where difficulties appear to be most acute.

Comparison of the structure and distribution of Maori and pakeha populations reveals many significant contrasts. Although in 1951 (the most recent year for which complete figures are available), the 15,844 Maoris were not markedly less numerous than the 17,156 pakeha, their comparative distributions are anomalous (*Fig. 2*). Forty-three percent of the pakeha population lived in the boroughs and townships which

constitute the servicing centres of this predominantly farming area. The remaining fifty-seven percent were spread fairly evenly over the developed lands, with higher concentrations where the land was more productive, as around Kerikeri. In comparison, the Maoris were very largely rural dwellers. Eighty-three percent lived outside the boroughs and townships but, unlike the rural pakeha, they were not predominantly farmers. They tended to cluster thickly on some of the Maori land, often in such isolated areas as Te Hapua, Mitimiti and Mangamuka, which provided their dwelling places but not their livelihoods.

Age-groups, birth and death rates, and total population changes show further important differences between the Maori and the pakeha, particularly when seen in relation to population growth and decline. Although the northern Maori birth rate is below the New Zealand Maori average it is considerably higher than that of the pakeha (Table II). Certainly this Maori fecundity is partly balanced by the higher Maori death rate, but the excess of births over deaths remains higher than that of the pakeha by ten per thousand. If it were not for outward migration the Maori population would doubtless outstrip the pakeha rather than the reverse which is the case at present. By comparing age groups (Table I) it becomes obvious which section of the rural Maori population provides the migrants—the unsettled single young men and women in the sixteen to twenty-five-year age group. The result is an unbalanced population structure in Maori districts outside the towns, with large numbers of children and comparatively fewer adults. Only in this way can the decline in the Maori population in the counties of Hokianga and Whangaroa, and the comparatively small increase in the other two counties, be explained.

MAORI AND PAKEHA SETTLEMENTS

Population contrasts are also reflected in the types of settlements. Kaitia, Kaikohe and smaller centres such as Rawene are primarily servicing centres with predominantly European population. Their structure is similar to hundreds of other similar centres throughout New Zealand—a small commercial core with fairly close housing development within the built-up area, and some ribbon development along the highways. There is also a rural pattern with each house situated upon an individual farm, with occasional small concentrations centred on a local store and post office. Of lesser significance are such



Fig. 1. Distribution and use of Maori land in the four northern counties

holiday resorts as Paihia and Russell with their weekend baches and largely transitory population.

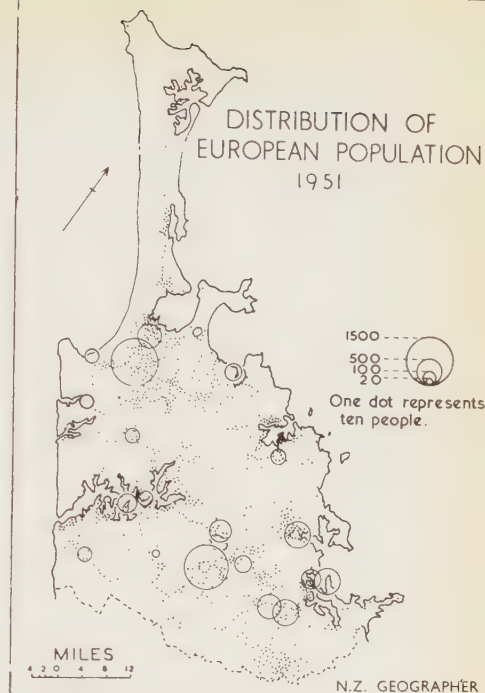
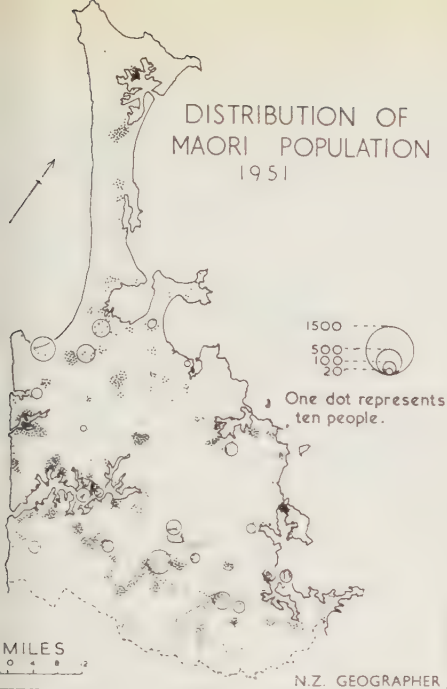
The only type of pakeha settlement to have a Maori counterpart is that associated with dispersed farming, yet even the casual observer would readily distinguish the two. Maori houses may be located upon individual farms, but they are generally smaller than the pakeha dwellings, unfenced, and without decorative gardens and lawns. Other distinctive features are the lack of farm buildings and fences and the presence of the ubiquitous quarter-acre patch of vegetables, often at some distance from the house.

In many places these dispersed farm settlements are intermingled with semi-nucleated Maori settlements. The distinctive pattern in these areas is one where the nucleus is formed by the school, church, meeting-house and store, around which cluster houses on sections of an acre or two. Away from the inner core, houses are more scattered and, although many stand on small plots of land, the majority are located on farms. Such settlements are as often to be found in isolated valleys as flanking a main road. Few if any of these villages could be called servicing centres, nor does there appear to be sufficient work to occupy the labour force inferred by such a large population. Most of these villages have an air of untidiness, particularly in the winter when the vegetable gardens are empty and weed-infested.

Even more desolate and untidy are some of the isolated coastal settlements, where the most striking feature is the very high population in relation to apparent resources. The large areas of vegetables, weed-infested pasture and the numbers of horses and scraggy milking cows show the nature of the attempt to gain a living. The rusting fences, muddy roads and decrepit *whare* are in distinct contrast to the teacher's residence, school, meeting-house and church which are by far the most important buildings in the close-knit settlements.

Although there is a small urban Maori population, this also has a different pattern from that of the pakeha. Extending somewhat irregularly around the outskirts of towns such as Kaikohe and Kaitia it is in one sense of the term, a 'dormitory' type of settlement with small overcrowded houses located on untidy sections of an acre or more. Growing a few vegetables and grazing a cow or two, these sections form a base from which the Maori can work at local labouring jobs.

It is in the isolated villages that there is the most notable lack of young people in the sixteen to twenty-four-year age group. The



Figs. 2 and 3. Distribution of Maori and European population

reason for migration appears to lie principally in the small acreage of developed land. Further analysis is essential to disclose the cause or causes of such restriction of cultivation—to find, in brief, whether it results from lack of land or failure to utilise available land.

MAORI LAND

Of a total of 1,633,000 acres comprising the four counties, Maoris have an estimated 348,500 acres. The remaining 1,284,500 acres includes State Forest, Crown lands, Crown leased lands, Maori land leased to the pakeha and freehold lands. All of these categories are in practice though not in theory, utilised by the pakeha rather than by the Maori. It may appear to be theoretically invalid to include other types of land such as State Forest and Crown lands with pakeha freehold, but they may be regarded as the counterpart of Maori undeveloped scrub and bush lands. With one notable exception at Ngataki, these lands where developed, have become owned by the pakeha.

If these areas be equated with total Maori and pakeha population then the acreage per head is 22 and 75 acres respectively (Table III). But much land is unfarmable, and any meaningful figures would have to evaluate the present state of development and the future potential, not only in terms of total population, but also in terms of rural popula-

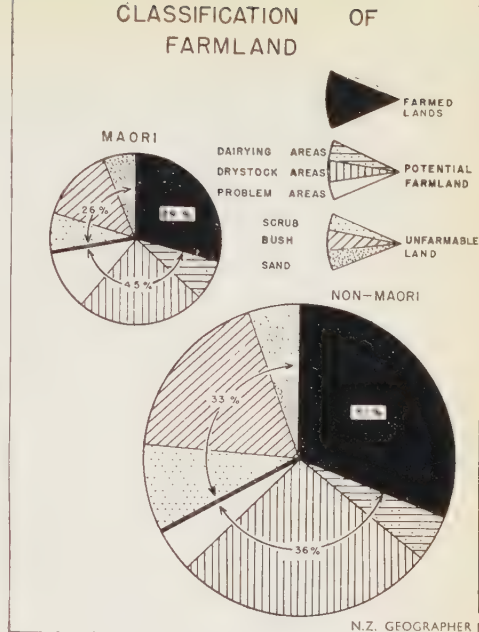
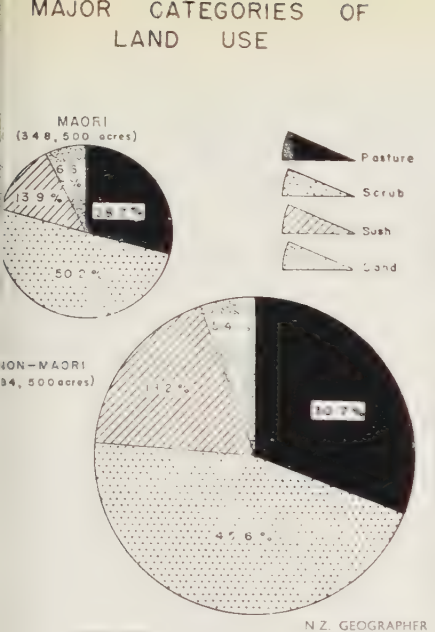
tion. It can then readily be seen that not only has the Maori far less land in production, but even if it were increased to the possible maximum of 16.6 acres per head of rural population, it would still be less than half of the present European average. These figures prove rather conclusively that the Maori has not enough land for the rural population to be supported in a manner even approximating that of the rural pakeha. Figure 5 indicates that although the Maori could probably double his present area of farmland, so could the pakeha. The claim that the Maori has land that should

TABLE I
PERCENTAGES OF POPULATION BY AGE GROUPS, 1951:
MAORI AND EUROPEAN

	15 years and under		16 years and under 25		25 years and under 55		55 years and over	
	M	E	M	E	M	E	M	E
Four northernmost counties <i>excluding</i> boroughs and towns	57.0	37.1	12.2	11.3	24.5	35.8	6.3	15.8
Four northernmost counties—boroughs and towns only	38.9	30.8	25.3	11.6	31.3	41.5	4.5	16.1
NEW ZEALAND TOTAL POPULATION	40.0	31.4	23.8	11.9	31.1	39.1	5.1	17.6
		M: Maori		E: European				

be developed is therefore correct, but it cannot be claimed that failure to develop it or make it available is generally preventing pakeha economic expansion in view of the large areas of non-Maori land which still await development. In short, both Maori and pakeha have approximately equal proportions of the various types of land within the area, but very unequal amounts of used and usable land *per capita*.

The present situation presents a dual problem: many fewer rural Maoris obtain full support from their own land than do rural pakehas and those who do so maintain themselves have much smaller farms.



Figs. 4 and 5. Land use and land classification in the four northern counties

Compared with the average Northland pakeha dairy farm of 221 acres, the Maori acreage of 145 acres is considerably smaller. In view of this it is not surprising that production per Maori supplier is also generally much smaller. But averages tend to conceal the true position. Figures supplied by three of the five dairy factories (Table IV) show that large numbers of Maori farmers are producing amounts of butterfat which are obviously too small to provide a living, and that very small numbers are producing sufficient butterfat to provide a 'comfortable' income. The pakeha pattern shows the reverse condition. Production per cow is also low on Maori farms (Table V), especially among the smaller suppliers (*Fig. 6*), a tendency which, although occurring among the pakeha small suppliers, is by no means so marked.

At this point it must be emphasised that despite the generally low standard of farming, some good Maori farms are to be seen in all counties, even if not in all districts. None may be equal to the very finest class of pakeha farm with its long-established pastures, excellent house and buildings and well-bred herd, but many are considerably better than the average pakeha farm and would be good by any standards.

Further consideration of the conditions under which farming is carried out reveals other causes for the generally low production of Maori farms. Most noticeable is the concentration upon dairying to the exclusion of almost all other sources of farm income. There is

only one Maori sheep station in addition to a few isolated areas where sheep and cattle are grazed in a hapazard manner. As a result, large areas of steep land where pasture control is impossible under a dairy-farming economy are reverting to scrub even though regularly grazed by cows.

TABLE II
BIRTH AND DEATH RATES 1956
(Per Thousand)

	FOUR NORTHERNMOST COUNTIES		NEW ZEALAND	
	MAORI	EUROPEAN	MAORI	EUROPEAN
Birth Rate	39.68	28.15	44.64	24.67
Death Rate	7.60	6.03	9.37	9.00
Excess of Births over Deaths	32.08	22.12	35.27	15.67

TABLE III
AVERAGE ACREAGE OF LAND PER CAPITA
FOUR NORTHERNMOST COUNTIES

	Total Maori Population	Total European Population	Rural Maori Population	Rural European Population
Total Land <i>per capita</i>	22.0	74.9	26.4	130.8
Farmable Land <i>per capita</i>	13.8	46.9	16.6	81.9
Present Pasture <i>per capita</i>	6.4	23.0	7.7	40.1

Although most Maori farms have adequate milking sheds, other buildings and machinery which are frequently found on pakeha farms are usually absent. Tractors are seen in a few areas but are unknown in many. Horses, which often have to fill a dual role as hacks and draught animals, are frequently the only source of power available to

the Maori. As a result, fertiliser is often left unspread until it spoils due to lack of proper storage facilities. Similar problems arise over the cutting, baling and storing of hay. It is not surprising then that in some districts fertiliser applications are at a minimum and supplementary fodder is not available. Without machinery land cannot be developed on individual farms, and that which has been developed cannot be stopped from reverting.

THE PROBLEM OF ISOLATION

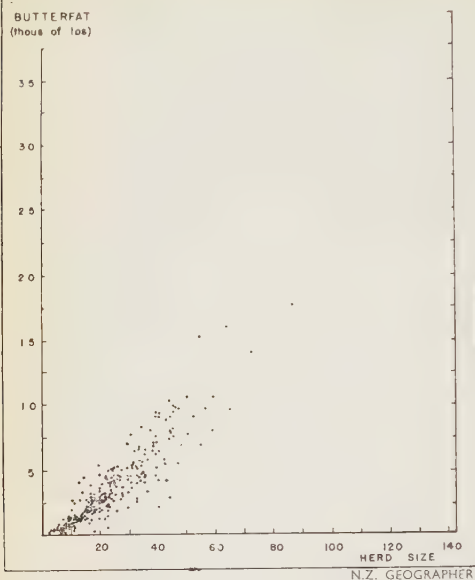
Isolation also appears to have an adverse effect on Maori farming practices. Fences and buildings are generally poorer and patches of scrub are more frequent. This reflects high transport costs, generally smaller farms and often steeper slopes. But seemingly just as important is the psychological effect of having no recreational and social amenities, and of seeing all the young people leave in search of work and amusement. The air of apathy is very real in many communities.

Besides isolation of communities, isolation of individual farms is often an important factor. Poor access has often led to abandonment where the owner has become tired of sledging or carrying his cream for a mile or more over muddy tracks. Particularly is this noticeable where the farm has been small or only partly developed and the rewards for labour have been meagre. Some of these uneconomic farms are a legacy of the 1930's when the aim of the Department of Maori Affairs was to provide work and at least a bare living for isolated communities. Others result from equal division among all children of farms already none too large.

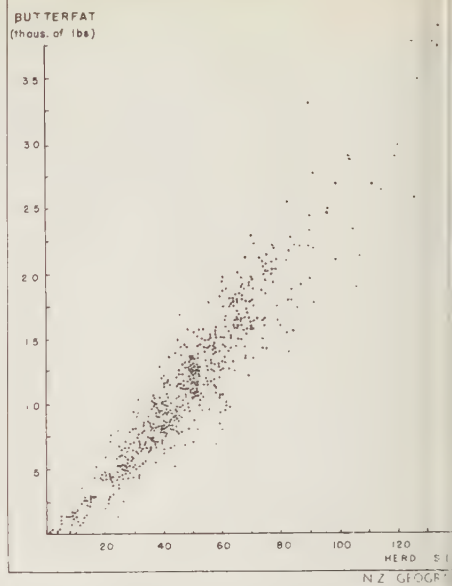
When uneconomic farms are located near sources of casual work, a distinctive pattern has arisen. Around Kaikohe and Kaitaia, the number of 'billy suppliers' to the local dairy companies is indicative of the number of small holdings which are providing a base from which to work at local labouring jobs. Often this type of occupation intermingles with the dormitory type of settlement discussed earlier.

The most serious effects for the Maori population are encountered where these uneconomic holdings are located in remote areas where no supplementary work is available. The settlement of Panguru on the northern shores of the Hokianga Harbour epitomises the troubles of a settlement where the number of uneconomic holdings is high. The small size of holdings has resulted in abandonment or amalgama-

CORRELATION of BUTTERFAT
PRODUCTION and HERD SIZE: MAORI
SUPPLIERS KAITAIA DAIRY CO



CORRELATION of BUTTERFAT
PRODUCTION and HERD SIZE: EUROPEAN
SUPPLIERS KAITAIA DAIRY CO



Figs. 6 and 7. Production of butterfat and size of herd on Maori and European dairy farms

tion, so that from a peak of seventy-six farms in 1941, the number had fallen to sixty-two in 1952 and the trend was still continuing.¹ Despite this tendency to enlargement, practically none of the farms with their steep reverting slopes and wet flats are large enough to justify their owners buying tractors to permit fuller development, and none have so far done so. In the circumstances it seems surprising that there is no cooperative ownership of the necessary machinery. Except for assistance with planting and harvesting food crops there is nothing even approaching community effort.

THE ROLE OF THE STATE

To an ever-increasing extent, the present-day Maori farm landscape in the four northernmost counties reflects the work of the Department of Maori Affairs. That over half of the 963 Maori suppliers to the five dairy factories are unit farms of the department is in itself proof of this, but when the obviously large number of the remaining farms which have at one time been assisted is included, the role of the department becomes even more obvious. Over the years the Maori has come to depend upon departmental advice and assistance to the almost complete exclusion of other sources of aid.

¹J. M. Booth, *Report on the Panguru Development Scheme*, Unpublished Report to the Department of Maori Affairs, December 1953.

TABLE IV

SUPPLIERS CLASSIFIED ACCORDING TO OUTPUT 1954-55

	Suppliers producing less than 1,999 lbs of butterfat	Suppliers producing from 2,000 to 5,999 lbs of butterfat	Suppliers producing from 6,000 to 10,999 lbs of butterfat	Suppliers producing more than 11,000 lbs of butterfat
Maori	250 (35%)	344 (48%)	107 (15%)	13 (2%)
European	85 (9%)	159 (17%)	303 (32%)	409 (42%)

TABLE V

COMPARISON OF MAORI AND PAKEHA DAIRY PRODUCTION 1954-55
(Kaitaia, Motukaraka and Kaikohe Dairy Factories)

Factories	Kaitaia	Whan-garoa	Motu-karaka	Kaikohe	Bay of Islands	Average all Factories
Average annual butterfat production per cow (in lbs)						
MAORI	159	143	N.A.	173	167	162*
EUROPEAN	234	195	N.A.	230	220	213*
Average annual production of butterfat per supplier (in lbs)						
MAORI	3,994	2,925	3,370	3,253	3,105	3,465
EUROPEAN	12,175	7,347	8,529	9,342	11,841	10,935
Average Herd Size						
MAORI	25	20	N.A.	19	19	21*
EUROPEAN	52	37	N.A.	41	54	49*

N.A. = Not available

*Motukaraka not included

Since the 1930's and the development of 'subsistence' farms, policy and methods have changed. Today the emphasis is on the development of large blocks which can be bought from the many owners and developed more economically. The size of the farms varies according to the area required to achieve an estimated eventual production of butterfat of from ten to twelve thousand pounds. Until the debt is repaid, supervision of the carefully selected applicant is strict. Unfortunately supervisors still have too many farms under their control to allow enough time to educate the individual, a fact which may explain



Photo: National Publicity Studios

Fig. 8. A recently developed Maori dairy farm in the far north of Mangonui County

the decline in production on most farms after the farmer becomes independent of such direction. But, in many cases, this appears to be due to a preference by the farmer for an easier life, and to willingness to accept fewer material goods in order to attain leisure.

Despite the apparent failure to produce first-class farmers, it is obvious that most of the progress made by Maori farmers has stemmed from the work of the Department of Maori Affairs. Over the past twenty years improvements have been considerable, even if disappointing compared with those attained under similar schemes to assist pakeha farmers. This leads one to suspect that in its preoccupation with land development, the department has failed to realise the importance of community and social development as a necessary adjunct

to their work. So far the only concession to this view has been the appointment of one research officer to work with three isolated communities in the Panguru district.

A decision which the department will be forced to make in the near future concerns the Maori lands which are suitable only for running dry stock. So far, almost the only instances where such lands have been used result from lease to a pakeha. In some cases this has led to development of good farms, but, particularly in the northern part of Hokianga county, the fertility of the land has been 'mined' and soil erosion is becoming serious. If it is intended to use such lands in future for Maori farming, the lack of Maori farmers with suitable training will pose a considerable problem unless some form of training is instituted in the near future.

CONCLUSION

Within the four northernmost counties of Northland the present situation is serious. The Maori is residing on his land, but does not depend on this for more than a fraction of his income. Such improvement as is being made comes not from his own efforts but through government assistance. Mostly this takes the form of land development, which as has been seen, is only a partial answer to the problem of individual and community outlook. It provides for those who, in present circumstances, wish to become farmers on their own account; but, for the majority who do not so wish, there is no alternative but to live in poverty or move to where work is offering. In almost every case this means moving to crowded, sub-standard accommodation in towns and workcamps. The possibility that community and social development could prevent these ills at their source is an inviting one. By making the life of farming communities more attractive a larger number of young Maori people might be persuaded to become farmers (albeit, of a higher standard than those at present) and so halt the trend towards the status of landless, ill-housed labourers. At present the willing few are receiving considerable benefit and assistance, but the major problem of helping the rest of the Maori people to find a satisfactory way of life has so far received little or no attention. The blame for this state of affairs must be shared by both the government and the Maori; the government for failing to realise the wider implications of its task, and the Maori for his failure to make adequate use of the many opportunities which are available to him.

THE SPECIAL CROP ECONOMIES OF WAIMEA COUNTY, NELSON

E. R. BLOOMFIELD

WAIMEA COUNTY, an administrative unit of a million acres, is bounded on the east and the west by bush-clad mountainous ranges 4000 feet high, and on the north by Tasman Bay. Between the eastern and western ranges are the low, rolling Moutere Hills of Pliocene gravels. Where the Moutere Hills adjoin the ranges to the west lies the valley of the Motueka River; between the eastern ranges and the Moutere Hills are the Waimea Plain and Wai-iti Valley. Alluvial lowlands occupy only 75,000 acres, or 7.5 percent of the area of the county.

The farmers of Waimea County, confined to a limited area of alluvial land, earn their living by intensive methods of land use. Two-thirds of the farmers' income comes from special crops.¹ Of these tobacco and apples are the most important, but peas, hops, stone fruits, berry fruits, tomatoes and other vegetables are also significant. Yet the area in these crops amounts to little more than 9000 acres, less than one percent of the area of the county.

Farming is further distinguished by the relative importance of these crops in comparison with the rest of New Zealand. Waimea county contains the 418 farms which grow all the country's tobacco, and the 109 farms which grow all New Zealand's hops. The county contributes two-thirds of the dominion's export of apples and pears and forty percent of the pip-fruit acreage is found here.

LOCAL SPECIALISATION

There is a marked concentration of crops in various parts of the county, and from the diversity of crop combinations three crop regions can be recognised. The Motueka-Moutere region is the most important, with ninety-five percent of the tobacco, eighty percent of the orchard, and seventy percent of the hop acreage. Though larger in area, the Waimea Plain, and the Wai-iti Valley which leads off it to the south, are less important for special crops. Peas, tomatoes (including a large area of glass-house tomatoes) and other vegetables

¹ T. Rigg: *Agricultural Resources of Waimea County*, Nelson 1943, p. 4.

are most important, and the many orchards here include most of the county's stone fruit. The coastal zone near Stoke is intensively cultivated by market gardeners and orchardists, and the hillsides there are used for early vegetables. The Nelson and Wellington city markets are more accessible to the farmers of this area, as were the canning and 'quick freeze' factories until the recent developments in Motueka.

Tobacco, hop and raspberry gardens, and orchards dominate the landscape of the Wai-iti Valley in the south. In the central part of the plain, however, mixed farms of several hundred acres are found on the drought-prone gravel soils. On these tomatoes and peas are grown as part of the broad economy based on sheep, fodder crops, cereals, and dairy cows.

TABLE I

DISTRIBUTION OF CROPS BY CROP REGIONS, WAIMEA COUNTY*

	MOTUEKA-MOUTERE	WAIMEA, WAI-ITI	INLAND VALLEYS
Tobacco	2,995	217	—
Hops	520	55	45
Pip-fruit	2,600	700	—
Stone fruit	110	290	—
Small fruits	20	70	110
Vegetables (excl. peas)	100	700	—
Peas	500	700	—
TOTAL	6,845	2,732	155

*Chiefly from Department of Agriculture statistics. Estimates have been made for the distribution of peas and vegetables.

To the south are the interior valleys of the Motueka River and its tributaries. In the Sherry, Tadmor, and Motupiko Valleys there are many hop and raspberry gardens belonging to farmers whose main activity is generally hill-country sheep farming. The heavy frosts ensure a dormant period in the raspberry gardens, resulting in better crops. The frosts also make tobacco growing hazardous, and the competition for land, which led to the abandonment of small fruit cultivation in Motueka-Moutere in favour of tobacco, is here absent. Though the acreage of hops and raspberries is small the effect on the landscape and economy is considerable.

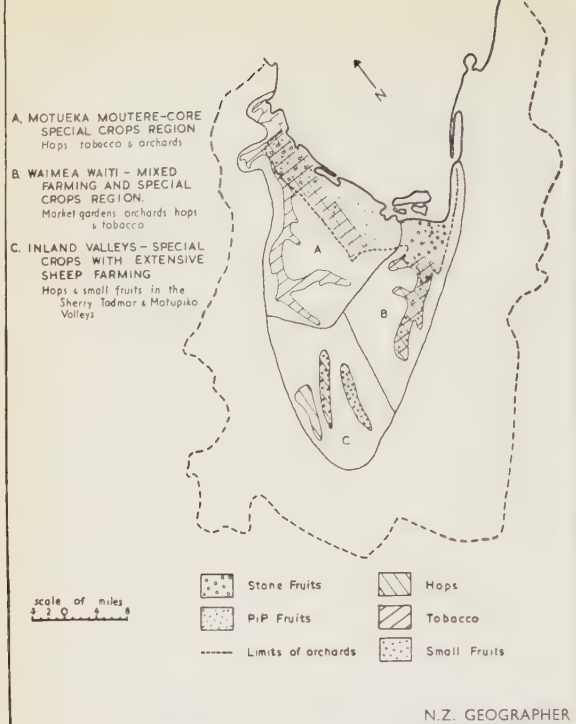


Fig. 1. Waimea County showing special-crops regions

PHYSICAL CONDITIONS

The Tasman Bay lowlands are a suntrap, sheltered by high ranges and facing north to the sun. With an average of 2,490 hours of sunshine Nelson is the sunniest station in New Zealand, yet the rainfall of 39 inches is greater than that at the slightly less sunny localities of Blenheim and Napier. The combination of high sunshine, low drought risk and low wind incidence is unique in New Zealand.

Within this climatically-favoured area conditions are especially attractive in the Motueka-Moutere district. The rain shadow effect of the western ranges is less pronounced and Motueka has ten inches more rain than Nelson. Furthermore, the alluvial soils of Motueka-Moutere are generally more retentive of moisture, thus increasing rainfall effectiveness.

Even at Motueka, however, there are hazards to crops, especially tobacco, which is a crop so easily damaged by frosts, hail, or floods that a compulsory crop insurance scheme is in operation. In all but three of the years between 1945 and 1953 frost caused some damage, and two-thirds of the payments made to growers were occasioned by frosts.² The increasing frost hazard inland limits tobacco growing to

² *New Zealand Tobacco Board Annual Report*, Wellington, 1954.

the southern boundary of Motueka-Moutere. Drought conditions, which occur after two weeks without rain on the sandy tobacco soils, make expensive sprinkler irrigation plants necessary on many farms, and wind damage to tobacco leaf occurs in many seasons. Though the climate is generally favourable to tobacco and other crops climatic hazards are nevertheless present. Hops and tobacco have both been grown in many parts of the North Island in the past, though on a small scale, and it would seem that climate is not a decisive factor in limiting these crops to Waimea county.

Since tobacco grows best in soils without excessive organic matter and with a sandy texture, and since the apple orchards of the Moutere Hills are on land for which no other agricultural use could be found, it is apparent that high soil fertility has not been an essential factor in the development of special-crop economies. Heavy dressings of artificial fertilisers, generally half a ton to the acre, must be applied to all the crops. It has been the inadequacy of most of the land under other systems of farming that has encouraged the development of special crops.

HISTORICAL BACKGROUND

In 1842 the New Zealand Company surveyors reported there was insufficient land available for the intended subdivision into 201-acre holdings. Instead, 50-acre 'accommodation sections' were offered the new settlers. Those with capital were dissatisfied, and instead took up small 'empires' in the tussock grasslands of Marlborough. Tasman Bay was left to small farmers, and in fact many of the holdings were granted to labourers in return for work on the company's roads and drains.³ This initial settlement pattern produced conditions favourable for the adoption of crops with a high return per acre.

Further, important advantages for special-crop cultivation in Waimea County have accrued during the last hundred years. Marketing organisations, set up by the government, control the sale of apples and pears, tobacco, hops and raspberries. Local research facilities are highly organised; the Cawthron Institute is concerned with local horticultural problems, while there are field research stations in Motueka-Moutere experimenting with hop, tobacco and pip-fruit cultivation. Local processing industries for fruit and vegetables, and tobacco-treating depots have been established. Small tidal ports at Motueka

³ Robert Pratt: *Colonial Experiences, or Incidents and Reminiscences of Thirty Four Years in New Zealand*, London, 1877, p. 19.

and Mapua have cool storage plants and handle the flush of the apple harvest, overcoming the problem of isolation. Sawmills near the apple orchards cut the large amount of case timber necessary.

With such a complex organisation behind the intensive land use pattern it is doubtful whether other parts of New Zealand could seriously challenge the supremacy of this locality in the production of its distinctive crops, even though suitable soil and climatic conditions might be found.

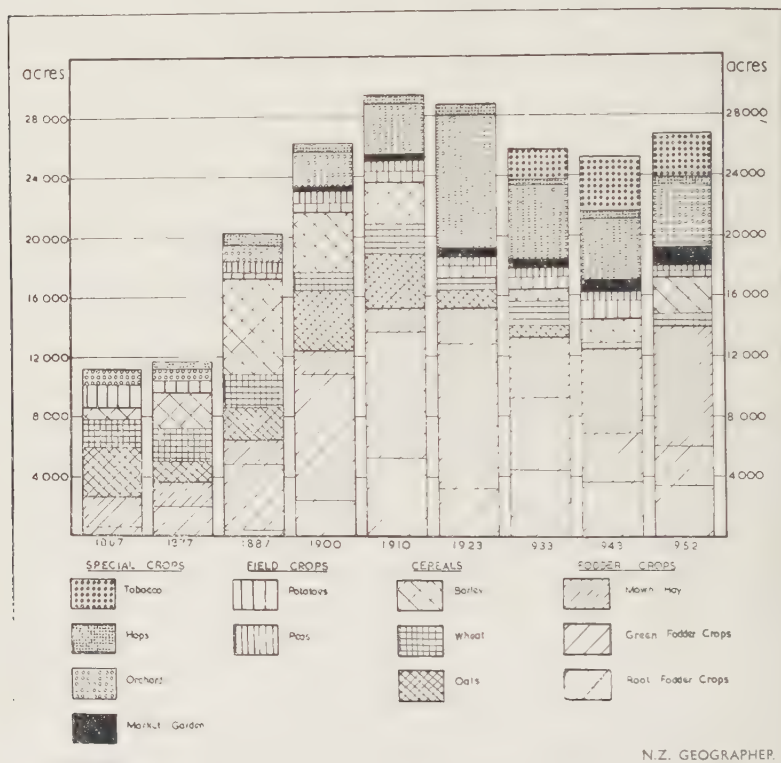


Fig. 2. Crop acreages in Waimea County at selected dates

DEVELOPMENT OF SPECIAL-CROP ECONOMIES

Agriculture in Waimea County has developed from a system of mixed farming, in which cereals and fodder crops were important, towards an economy dominated by special crops. This evolution has taken place in six phases.

During the first period, up to 1855, settlers concentrated on subsistence farming, but following the gold rush to Collingwood in 1856

a second period of commercial production of cereals and livestock was introduced. Between 1870 and 1910 there was a significant expansion of fruit and hop growing, but fruit was relatively no more important in Nelson than in many other land districts in New Zealand. Stone fruit orchards and raspberry gardens were more important than pip-fruit, which was more susceptible to pests. However, hops, established in the first years of settlement, probably by Kentish people,⁴ were relatively more important than at any period since. The county maximum, 947 acres, was recorded in 1906. The rapid increase in cereal and fodder crops, and in sheep numbers, was more important than the development of special crops until 1910.

In that year a syndicate was formed to plant blocks of the scrub-covered coastal Moutere Hills in apple trees.⁵ A boom set in, based on the slogan 'Apples for Export', and by the close of the first war there were 11,000 acres of orchards in the county. Today the acreage has declined to 3,500. Many orchards were sold to fortune seekers from the city without agricultural experience, and many trees never came to bearing. The struggle to adapt pip-fruit cultivation to the difficult soils of the Moutere Hills was overcome only after many years of experience, and with scientific guidance, particularly from the Cawthron Institute. Government assistance has been considerable, and the initiation of the boom resulted mainly from the offer of a guaranteed price for apples grown for export.

Over seventy percent of the county's apples are exported. None were shipped out between 1940 and 1945 and many orchards were uprooted. Post-war recovery has been rapid, and the 1955 crop of almost one and a half million bushels was a record, contrasting with just over half a million bushels in 1924, when the acreage was twice as large.

EXPANSION OF TOBACCO GROWING 1920-1948

Orchard development took place mainly on the Moutere Hills. By contrast tobacco growing, which began in the 1920's revolutionised cropping on the alluvial flats of Motueka and its hinterland. This, the

⁴ The *Statistics of Nelson 1842 to 1854* record hops grown in what is now the city of Nelson in the first year of settlement. As most of the Nelson immigrants seem to have been from the vicinity of London it is probable that Kentish people introduced hops. A. H. Clark in *The Invasion of New Zealand by Peoples, Plants, and Animals*, New Brunswick, 1949, p. 141 claims hops were introduced by the later German settlers. The evidence is against this, the Germans not arriving until 1843.

⁵ See N. Robinson: *History of Fruit Growing in Nelson*. Unpublished Thesis, Canterbury University College, 1944.

fifth phase of agricultural evolution, has established the character of the plains and valleys of the Motueka area. Though tobacco growing began in the North Island,⁶ and the acreage there was significant as late as 1938, since that time the crop has been confined to Wairarapa County. Prosperity and stability were ensured by the establishment of the Tobacco Board in 1936, though this was too late to save the abortive schemes for tobacco growing in the North Island. The Tobacco Board controls contracts, production and sale of leaf, which is entirely consumed in New Zealand and provides one-third of the country's requirements. To protect the industry manufacturers are required to use one-third New Zealand leaf.

After a peak of 4,393 acres in 1948 there has been a decline in acreage, and production is appreciably less than the five million pounds of this peak period. After twenty years of continuous tobacco growing many fields no longer show the same profit, and the annual concern over labour shortages has contributed to this decline.

The major feature of the latest period of agricultural change is the expansion of vegetable growing. In 1950 there were 1,500 acres of vegetables including 500 acres of peas. In 1956 more than 2,000 acres of vegetables were grown including some 1,200 acres of peas, an expansion largely made possible by the installation of several 'quick freeze' plants near Nelson and Motueka. In this recent period the hop acreage has remained constant at some 600 acres, but was little more than half this during the depression of the 'thirties. Production is generally more than sufficient for New Zealand's requirements, and a small amount is exported.

THE MOTUEKA DISTRICT

Further aspects of the major crop economies are revealed by a more detailed study of Motueka-Moutere, the most important special-crop region. Here, within an area fifteen miles by five miles, nestled under the western ranges against Tasman Bay, is a landscape of striking contrasts. Topographically there is the contrast between the Motueka plain and its hinterland valleys, the rolling slopes of the Moutere Hills, which scarcely exceed 500 feet in height, and the steep slopes of the western ranges rising sharply from the narrow lowlands. Contrasts in landforms are accentuated by contrasts in vegetation. The hills are

⁶ H. L. Wise: *Tobacco Growing and Manufacture in New Zealand*, is the most complete account, but see review in *New Zealand Geographer*, Vol. 2 No. 1, April 1946, pp. 275-6.

largely covered in gorse and bracken, although orchards and exotic pine plantations add variety to the coastal strip of the Moutere Hills, and the grass-covered slopes in the Stanley Brook area make hill-country sheep farming possible.

On the flats themselves contrasts appear, for while most of Riwaka and the lower Motueka Valley are characterised by special crops pasture is more common on the plain south of the river, and in the

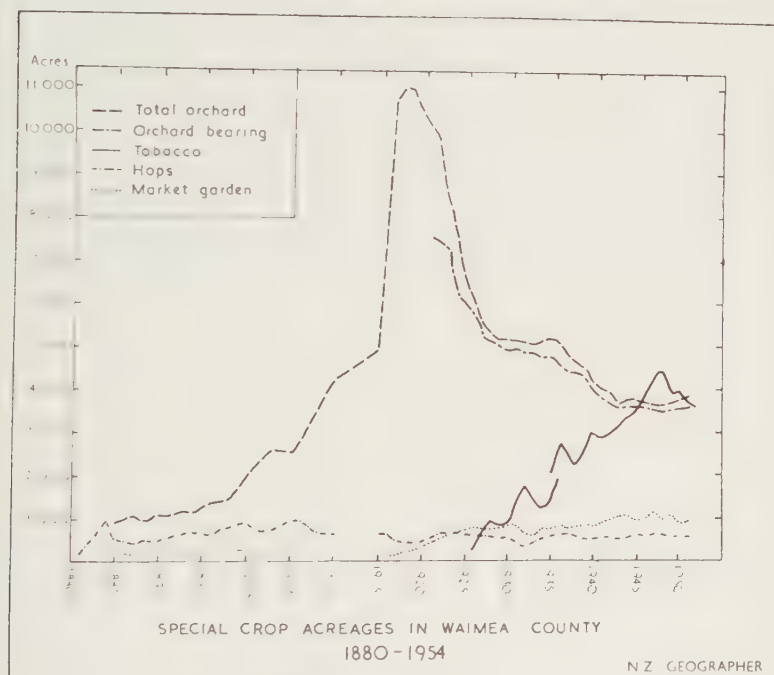
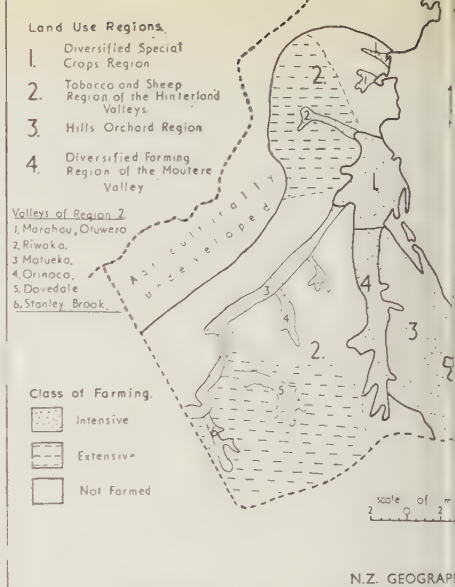
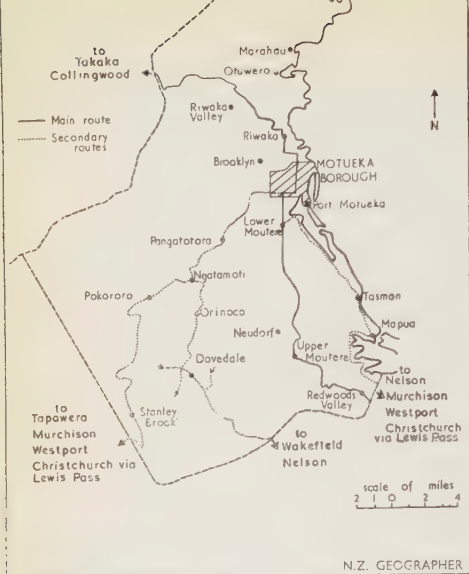


Fig. 3. Changing acreages of certain crops

Moutere Valley. Stony areas, badly drained tracts, and coastal lucerne-covered sand areas add to the diversity. In fact, of approximately 20,000 acres of alluvial land, less than 7,000 acres are in special crops.

From the pattern of crop combinations four land-use regions can be recognised: the diversified cropping of the plain, the monocultural tobacco growing of the hinterland valleys, the monocultural apple culture of the coastal Moutere Hills, and the combination of special crops and mixed farming in the Moutere Valley.

On the plain is grown over half of the tobacco, and this crop occupies a slightly larger area here than all other special crops combined. Most of



Figs. 4 and 5. Location map and land-use regions, Motueka District

the hops and peas, all of the stone fruit (mainly peaches) and a small part of the apple acreage is also found here, giving a greater diversity of crops than in any other land-use region. This six-mile strip of plain has perhaps the most distinctive rural landscape in New Zealand. Views of tobacco fields, hop gardens and orchards are interrupted by the houses, tobacco kilns and storage sheds, hop kilns, occasional fruit packing sheds, and numerous workers' baches. In Riwaka large tracts of land are continuously cultivated for special crops. The characteristic farm is about twenty acres, and a few are fragmented, as is witnessed during autumn by the light farm trucks carrying leaf from a distant field to the drying kiln.

THE HINTERLAND VALLEYS

In the hinterland of the plain, in narrow valleys set in the granite ranges, tobacco, some 1,100 acres in all, is practically the only special crop grown. On the sinuous valley flats continuous fields of tobacco are frequently seen, but within half a mile of the rivers the granite hills rise steeply, covered today in gorse and bracken. Once the hills were mantled with beech forest and were burned in the hope of establishing hill pastures on the difficult soils. Hill blocks are still used for sheep by some farmers, but a great many farmers now derive their entire livelihood from small tobacco farms on the flats. The rasp-



Photo: National Publicity Service

Fig. 6. Tobacco fields in the Motueka Valley

berries, hops and orchards which were once found in various valleys have been replaced by tobacco. The profits to be made from this crop in the depression of the 1930's, the reversion of hill pastures, and the demands tobacco makes on the farmers' time have contributed to the deterioration of hill country throughout Motueka-Moutere.

THE COASTAL MOUTERE HILLS

Three elements combine to make the land-use pattern of the coastal Moutere Hills. Apple orchards, averaging twenty acres of stunted-looking trees, line the dusty roads along the coast. Intermingled with these are wastes of gorse. Although the gorse land is worth less than £10 an acre, the trees alone, in adjoining orchards, are valued at more than £100 an acre. At present orchards occupy 2,000 acres. The third element of the pattern is the plantations of *Pinus radiata*, owned by Nelson sawmillers, and providing valuable timber for fruit cases.

There is a rawness about this land-use region; old-established homes and families are absent. It owes its character to the boom after 1910, when an orchard economy was introduced to an area without any back-ground of intensive land use, resulting in agricultural and social

problems not encountered in the establishment of tobacco in areas which were previously farmed intensively. The evolution of a scientific manurial programme, including the use of trace elements boron and magnesium, has given stability to the economy, and has made possible full utilisation of the natural advantages of sunny aspect, freedom from frosts, moisture-retentive clay soils, and cheap land.

The small township and port of Mapua have grown up to allow coastal shipping to clear the flush of the harvest from the cool store, and here too is a large chemical plant producing orchard sprays.

THE MOUTERE VALLEY

The Moutere Valley is similar to the central Waimea Plain in that pasture, lifeless and brown in summer, and fodder crops are the predominant forms of land use. The heavier soils, derived partly from a drained swamp, are not well suited to tobacco, and this valley, set in the gentle slopes of gravel hills, is quite distinct from others in Motueka-Moutere. An example of the mixed-farm system of the valley is found in a typical holding of 147 acres. There are 45 dairy cows and 100 ewes; twelve acres of turnips and swedes are grown while cash crops are barley, grass and clover seed, and a few acres of peas for canning. Mixed farming of this pattern characterised the lowlands of the whole county before 1910. Other farms in the valley frequently have apple orchards, and occasionally a few acres in hops or tobacco.

KING TOBACCO

Tobacco plays a greater part in the life and landscape of Motueka-Moutere than does any other crop. It contributed £752,000 of the total value of £1,650,000 of special crops in 1954. By contrast apples and pears contributed but £628,000. The typical tobacco farm has from 15 to 20 acres of tobacco, as much as can be handled by two drying kilns. Frequently tobacco is the sole enterprise and occupies the whole farm, apart from the land used for buildings. A few very small tobacco farms exist, where growers obtain their entire living from as little as five acres of land.

The life of the farmer and his family is geared to the strict routine of seasonal work. The farmer's wife is frequently indispensable in the harvest, as she provides the skilled fingers which tie the leaves on the sticks. Some labour must be employed for eight months, and as many



Photo: National Publicity Studios

Fig. 7. Apple orchards at Tasman on the coastal spurs of the Moutere Hills. The Waimea Plain is in the middle distance

as six or eight persons are accommodated on the farm for the harvest from mid-January to March. Along with labour troubles the grower is perplexed by the problem of maintaining productivity in his continuously cropped fields. Peas for the 'quick-freeze' factory offer a possible rotation, but the return per acre is much lower and small farms cannot afford this.

HOP GARDENS

Unlike the tobacco grower, the hop grower almost invariably has some other enterprise, fruit, tobacco, or sheep and dairy cows. The number of disused kilns indicates the former wide distribution of the crop, but gardens are now found mainly on the banks of the Motueka River and at Upper Moutere. The seventy growers in Motueka-Moutere have an average of six acres of hops, and are nearly all families with a long association with hop cultivation. Methods of cultivation have changed little, and the characteristic hipped-roof hop kilns were mostly built more than fifty years ago.

On the hop farm only occasional seasonal labour is required until harvest, when for almost a month a six-acre garden requires eighteen

pickers. Though one or two large growers have installed hop-picking machines to avoid harvesting difficulties, the very high cost of these machines puts them beyond reach of the average grower.

Orchards on the plain frequently consist of a mixture of both pip and stone fruit. The trees are larger, and the yield of some 600 bushels per acre, higher than in the hill orchards where 450 bushels is average. However the smaller trees are more convenient for spraying, pruning and harvesting, while the fruit is also more exposed to the sun, so the representative orchardist of the hills, with his twenty acres of apples,



Photo: National Publicity Studios

Fig. 8. Women picking hops near Motueka

prosper. With the winter tasks of spraying and pruning to provide employment in the off-season, orchards have a relatively lower seasonal surge in labour requirements, and permanent labour is more important than on hop or tobacco farms.

Most of the apple trees in Waimea County are old, 84 percent being more than thirty years old, while the remainder are very young. Eleven percent are less than six years old.⁷ This uneven age grouping, in which only five percent are mature without being too old, results from overplanting up to the 'twenties, and cessation of plantings

⁷ J. H. Watt: *Official Survey of the Fruit-Growing Industry of New Zealand*, Wellington, 1954.

in the unfavourable times since. Though the yield is increasing, many orchardists are concerned by the expensive replanting programme which is called for.

POPULATION DENSITY

The two outstanding features of the population, its high rural density and seasonal migration, both reflect the agricultural pattern. The population density of the Motueka Plain (excluding the Borough of Motueka), is more than 200 per square mile, becoming as high as 280 per square mile or about one person to three acres at Riwaka. Even on the coastal Moutere Hills the density is 100 persons per square mile. By comparison the maximum rural population in the most intensively-farmed dairying areas of New Zealand is but 70 per square mile.

The permanent population of the district, about 7,000 persons, is supplemented in autumn by nearly 2,000 seasonal immigrants from all over New Zealand, but in particular from the Auckland area. Some are drifters from one seasonal job to another, and many of the numerous Maoris are in this category. Others, probably a minority, are on working holidays, and some come from overseas. The traditional quietness of rural areas does not exist in this district, when there is one newcomer to every four 'locals', or, on individual farms, two or three persons of diverse origins to every member of the farmer's family. The bustling streets of Motueka on a Friday night, the numerous local Saturday night dances, and a harvest festival in autumn, add a seasonal note.

Of the immigrants some 70 percent are females, but it is female labour which is in shortest supply. Hops and fruit employ proportionately more female labour than tobacco. Forty percent of the seasonal immigrants are employed on tobacco farms, 32 percent in harvesting hops, and 28 percent in fruit orchards, where permanent labour is more significant.⁸

To obtain labour, growers' organisations appeal through press and radio, and the Department of Labour pays fares one way for those who do a month's work. There seems little prospect of eliminating this seasonal demand, though the development of mechanised hop-picking would help. As the various processing industries associated

⁸ Statistics from Department of Labour and Employment, Nelson. It is assumed that 80 percent of the immigrants to the county are employed in Motueka-Moutere, and that 80 percent of the immigrants pass through the Department.

with the crops are also largely seasonal, developments in this field will hardly improve the position. The seasonal migration of labour is an inherent feature of special-crop farming.

MOTUEKA—THE URBAN CENTRE

The free-spending 'seasonals' give Motueka, with a population of almost 3000, and its new or renovated shops, a boom atmosphere in the season. The specialised requirements of local farmers give it a number of distinctive processing industries. Three tobacco-receiving depots, treating leaf for moisture content before dispatch to Wellington or Napier for manufacture, employ 170 persons during the winter months. In the three fruit and vegetable processing factories 130 persons find employment, mainly between December and July. Most of these are employed by a large firm established by the government during the war to dehydrate apples, for which there was little demand. Now, dehydration, quick-freeze and canning operations are carried on, and the factory is passing into private ownership. In addition one small tobacco-receiving depot and a canning factory are located in Riwaka.

CONCLUSION

The chronic shortage of seasonal labour, and the social problems arising from the heterogeneous group of immigrants, together with the risks inherent in the monocultural tobacco and apple growing, are the major problems of the crop economies in Waimea county. Apple orchardists are particularly exposed to the fluctuations of the overseas market, as was found during the second world war. In tobacco growing, soil deterioration follows in the absence of a rotation. For economic security and soil conservation therefore it would seem that diversification of the two monocultural economies would be advantageous.

Future trends in land use in the county will be determined by markets, and by government policy on these markets. At present the expanding market for frozen vegetables is creating a major change in the crop pattern, and, given favourable economic conditions, there is ample land available for an extension of any crop.

MANUFACTURING IN AUCKLAND: ITS ORIGINS AND GROWTH

1840-1936*

G. J. R. LINGE

THE FORESHORE of a bay in the Waitemata harbour was chosen as the most suitable place to found, on 18 September, 1840, the small settlement of Auckland as capital of the young colony of New Zealand. Captain William Hobson gave as his reasons for selecting the site 'the central position', 'the great facility of internal water communications by the Kaipara and its branches to the northward, and the Manukau and Waikato to the southward', 'the facility and safety of its port, and the proximity of several smaller ports abounding with the most valuable timber', and 'the fertility of the soil'.¹ By 1842 the township had a population of 1,971 males and 924 females, two-thirds of whom were between the ages of fourteen and forty-five.²

Information about the early manufacturing activities in Auckland is sparse,³ but the first consideration of the settlers was to provide themselves with the necessities of life such as food and clothing, and the materials with which to construct houses and buildings for the community. A list compiled in 1843, giving the occupations of 948 persons, indicates that there were by this time some 413 'mechanics and artificers' in the district.⁴ A steam sawmill is noted in 1842, and

* This paper forms part of a larger study of manufacturing in New Zealand made possible by financial assistance provided by the Goldsmiths' Company of London which is hereby gratefully acknowledged.

¹ William Hobson: 'Dispatch to the Secretary of State for the Colonies, October 15th, 1840', *Great Britain Parliamentary Papers Relative to New Zealand*, 1841, (311).

² *Census Book, Police Office Auckland*, 1842, Mss. in Auckland Central Library.

³ The author wishes to acknowledge with gratitude the assistance given by Miss G. Terry, Research Assistant, Auckland Provincial History, and Mr. G. G. M. Mitchell of Onchunga in supplying some of the information used in this paper. Other information was obtained by interviewing retired men who had worked in some of the early industries.

Many of the firms in existence today have little knowledge of the early history of their establishment. Some firms have attempted to find out these details and have failed, while others consider such research unnecessary and worthless. A remark was often passed in this connection to the effect that 'we were too busy setting up the business to have time to write about it'.

⁴ *Census Book, Police Office Auckland*, 1843.

in the following year a rope-walk and three water-driven sawmills are also recorded. By 1845, five years after the settlement was founded, sixteen industrial establishments are recorded, including not only four saw-mills, two flour-mills, and a rope-walk, but also two breweries, four brick-kilns, a cloth loom, a pottery and a tannery.⁵ In 1845 there were employed in trades which may be broadly termed manufacturing a total of 236 persons, of which building and woodworking occupied 118 workers, food and drink 39, apparel 32, metal working 18, printing and bookbinding 10, boatbuilding 10, leather goods 5, and rope-making, weaving, and woolcombing 4.⁶ Such industries as these were encouraged by the day-to-day demand and the delay of several months in obtaining supplies from overseas manufacturers.

EARLIEST INDUSTRIAL ENTERPRISES

There is evidence of the location of some of these early undertakings. Several references are made to the considerable amount of boat building which was taking place at this time around the shores of the Waitemata Harbour.⁷ One contemporary newspaper noted that 'the boat is to settlers what the cart is to most other people'. Although the first industries in Mechanics Bay were the saw-pits, built to provide planks for the official buildings and residences, a rope-walk was erected there in 1842.⁸ Although it is believed that a flour-mill operated from an early date in Mechanics Bay, the first windmill for grinding wheat may have been the one erected at Mount Eden by John Bycroft between 1843 and 1845.⁹ In 1848 a steam flour-mill known as Dangar Mill was erected in Official Bay,¹⁰ and soon afterwards Partington's mill was built in Karangahape Road, becoming a famous landmark on the skyline of the township.¹¹ The first firm to be founded which

⁵ *Statistics of New Zealand for the Crown Colony Period 1840-1852*, compiled by the Department of Economics, Auckland University College, p. 46. These figures have been taken from a variety of sources; for 1842, *Correspondence of the Colonial Secretary*, for 1845 the *Blue Book of New Ulster*.

⁶ *ibid.*, p. 25 'Details of Occupations of the British Civil Population of Auckland: 1845', compiled from the *Correspondence of the Colonial Secretary*, 45/1939.

⁷ For a more general description of the early growth of Auckland, see L. L. Pownall: 'Metropolitan Auckland 1740-1945: The Historical Geography of a New Zealand City', *New Zealand Geographer*, Vol. 6, No. 2, October 1950, pp. 107-124.

⁸ A. W. Reed: *Auckland, City of the Seas*, Wellington, 1955, p. 157.

⁹ The date 1843 is often quoted, but while the foundations were laid during this year the mill did not actually operate until 1845.

¹⁰ *New Zealand*, December 9th, 1848, p. 4.

¹¹ Reed: *op. cit.*, p. 172. See also 'Photogeography: The Growth of a City; Auckland 1840-1950', *New Zealand Geographer*, Vol. 6, No. 2, October 1950, p. 193.



Fig. 1. The Auckland district

is still in business on the same site was that of John Grey (now known as Grey and Menzies Ltd.) who opened an aerated-water manufacturing business in Eden Crescent in 1845. At a printery in High Street John Moore produced the first newspaper in 1841 and the first book in 1842 to appear from an Auckland press.¹²

Although the township around Commercial Bay was the main focus

¹² The first newspaper named *New Zealand Herald and Auckland Gazette* appeared for the first time on 10 July, 1841 but lasted less than a year. Maunsell's *Grammar of the New Zealand Language* was published in three parts in 1842, while the fourth and final part was printed in March 1843.

of commercial and industrial activity, other enterprises were being established from an early date in other parts of the Auckland isthmus.

The demand for timber encouraged the development of an important sawmilling industry. Throughout the 1830's the bush-clad slopes of the Waitakeres on the northern shore of the Manukau attracted gangs of pit-sawyers, especially at Big Muddy Creek, Mill Bay and Puponga Point.¹³ The first sawmill to be set up to prepare timber brought down the streams from the Waitakeres was brought to Onchunga on board the steamer *Osprey* in 1842 from the United States. The forests on streams draining east to the Waitemata Harbour were being worked in 1845 and some firms utilised the streams to drive mill machinery.¹⁴ These milling camps were, in some cases, the forerunners of present day settlements, the best known probably being the one set up by Messrs. Henderson and McFarlane in 1848 for their mill workers—Henderson still remaining as a borough name.

1850-1870

The civil population of the Auckland area had grown to about 8,000 by 1850,¹⁵ and the continuing steady expansion of population created conditions favourable to the growth of industry and trade. Industrial undertakings were increasing in number, scope and ambition but were still essentially concerned with the everyday necessities of the community. There were, however, difficulties which slowed down the rate of expansion. From 1848 to 1852 there was a steady departure of gold seekers from Auckland to California, and then after 1861 to Otago, attracted by the lure of 'easy money' during the goldrush there. Other handicaps were the Maori wars followed by the Hauhau disturbances and the Te Kooti raids. The withdrawal of the British troops, and the gold with which they were paid, after 1866, and the removal of the seat of government to Wellington during the previous year combined to bring about a slump in Auckland and distress to the smaller manufacturing and business concerns. However, the return of peaceful conditions, and the discovery of gold at Thames in 1867 marked the beginning of the return to prosperity and presaged a new

¹³ See M. Hargreaves: *Early Manukau 1820-1865*, Unpublished Thesis presented for the M.A. Degree in the University of New Zealand, 1943.

¹⁴ John T. Diamond: *Once the Wilderness*, Auckland, 1953, p. 68.

¹⁵ *Statistics of New Zealand for the Crown Colony Period 1840-1865*, Table 1, 'British Civil Population of Main Towns and Settlements: 1840-1852', p. 8.



Photo: N.Z. Hera

Fig. 2. Auckland in 1852 looking south from the Waitemata Harbour; Point Britomart in foreground and Partington's windmill on the skyline

phase of development of manufacturing during the last three decades of the century.

The enterprises set up during the twenty years after 1850 were, in the main, an expansion of industries already in existence. Newspapers, for example, began to appear daily and regularly, and the boatbuilding industry, increasing in ambition, undertook the manufacture of steamers in 1851. The improving communications and increasing size of the market encouraged some manufacturers to move to more appropriate locations.¹⁶ John Bycroft, for example, moved his flour-mill to Onehunga in 1853 for here a larger mill could be operated by a reliable supply of spring water, while an ample supply of wheat was brought from the Waikato by the Maoris. Noxious industries were also moved to more suitable sites; the Wardens of the Hundred of Auckland transferred a slaughterhouse from the township to Newmarket.

Firms were established which are still in existence today. In Shortland Street, in the central commercial area of the town, the firms of Leighton and Son, bookbinders to the government and stationery suppliers to the military during the Maori wars, and the Cambridge Clothing and Shirt Factory commenced operations in 1855 and 1867 respectively. Other entrepreneurs, originally in the wholesale or retail trades, turned

¹⁶ A regular service of horse-drawn buses was commenced between the Waitemata and the Manukau in 1851.

For accounts of the early communications see John Barr: *The City of Auckland New Zealand 1840-1920*, pp. 55-57; *Newmarket Borough Jubilee 1885-1935*, Newmarket Borough Council, 1935, p. 5; E. E. Vaile: *Some Interesting Occurrences—Early Auckland*, p. 22; and William Swainson: *Auckland the Capital of New Zealand*, 1853, p. 37.

to the manufacture of their own wares, a tannery being set up in Avondale, for example, by a leather merchant who had been in commercial premises in Wyndham Street for sixteen years.

Perhaps the most important development which took place during this period was the association of several manufacturing establishments in particular areas—districts which were becoming noted for their relatively marked industrial appearance. In 1853 Swainson described Freemans Bay as being occupied by saw-pits, brick kilns and boat-builders' yards, while Mechanics Bay was little built on, a large ropewalk, a shipbuilders' yard, a native hostelry and a few small shops being the only buildings.¹⁷ These were but the forerunners of the firms which became established in these areas soon afterwards. In 1854 a small foundry was set up in Mechanics Bay by Messrs Allright and Kinlock (taken over by George Fraser in 1862), and M'Nab and Co., steam sawmillers, and J. Hornby, ropemaker, were there by 1856. A brewery and the Phoenix Foundry were in Stanley Street by 1866, together with, on the northern (seaward) side of The Strand, the works of the Union Steam Sawmills and the nearby brickyard of Messrs Archard and Brown.¹⁸ It was an area, too, considered suitable for a tannery as the Ireland brothers commenced operations here in 1870.

GASWORKS AND BREWERIES

In Freemans Bay the most important new undertaking was the gas works, built between 1862 and 1865. During 1859 the first reclamation of the foreshore, in Commercial Bay, was commenced to the extent of nine acres, and shortly afterwards Messrs Thornton, Smith and Firth erected large flourmills on the reclaimed land in lower Queen Street. At that time the water from Mount Eden was found to be particularly suitable for brewing, and in 1860 the Great Northern Brewery was established by Seccombe and Sons on a six-acre site in Khyber Pass Road, utilising at first a spring from the northern side of Mount Eden. Two years later Hancock and Company established the Captain Cook Brewery almost opposite the other.¹⁹

Various enterprises were being undertaken in other parts of the isthmus. By 1866 in Onehunga there were Shalder's Steam Sawmills

¹⁷ Swainson: *op. cit.*, p. 28.

¹⁸ John Vercoe: *Plan of City of Auckland, 1866*. Scale 2 chains to 1 inch, in Auckland Central Library. This shows the buildings within half a mile of the wharf.

¹⁹ William Coleman (ed.): *A Short Sketch of Some Incidents in the Colonial Life of Thomas Hancock*, Auckland, 1885, p. 62.

on the beach, as well as a brewery, an engineering works (now known as the Clyde Engineering Works), a cooperage, a shingle factory, two sailmaking shops, two confectionery factories, a boot and shoe factory, a saddlery, a bread and biscuit bakery, and a shipbuilding yard which had been kept busy night and day during the Maori wars.

In the west, after the first brick kiln had been established on the Whau Stream near the southern end of Rosebank Road in 1852, brick and pottery kilns became a common feature of the landscape in Avondale and New Lynn. The Whau Stream was of particular importance, for it enabled the products to be taken on scows to Auckland and cargoes of stores, firewood and coal to be brought in return. There is evidence, too, that there were at least three tanneries in this district by the late 1860's.

TIMBER AND FLAX

During the 'fifties and 'sixties the western side of the Manukau Harbour became important for the milling of timber and native flax. In particular the southwest of the Manukau became noted as a flax-working area. The flax, which until the 'seventies was one of the most valuable industries of the pioneers, also provided Waiuku with much of its trade, for in the 'sixties it is estimated that there were at least forty flax-mills in the neighbourhood, almost every available stream being harnessed to turn water-wheels.²⁰

On the northern shores of the Waitemata Harbour little development took place, for communication across the harbour was poor and unsatisfactory. Attempts to run a regular ferry service were made frequently after 1854, but it was only when the Devonport Steam Ferry Company was formed in 1881 that a reliable service began and the northern side of the harbour became opened up for residential and, to a lesser extent, commercial development. It is not surprising, therefore, that in 1866 the only industry noted on the north shore was a shipbuilding yard and a bakery and confectionery.

In the period from 1850 to 1870 there was thus no innovation which radically affected the course of industrial development in Auckland. It is true that the discovery of gold at Thames created a demand for gold batteries and machinery, and while some firms enlarged their Auckland premises to take advantage of this new trade, others, such

²⁰ H. E. R. L. Wily: *South Auckland*, Pukekohe, 1939, p. 53.

as A. and G. Price²¹, left the area and commenced operations on the goldfields themselves. On the other hand, as the unsettled conditions caused settlement to be practically paralysed in every part of the Auckland province, there was a marked restraining influence on development.

1871-1900

The Province of Auckland was still neglected and isolated from the rest of the colony in the early 'seventies. A large area in the centre of the North Island was practically uninhabited by Europeans or left in the hands of the Maoris, and this area, lacking communications, cut off Auckland and the north from the capital and the South Island. Despite this isolation, however, the growth of road, water and rail communications within the district caused the city and boroughs on the isthmus to become 'the commercial, social and educational nucleus of a large and growing region of varied economic activity based on forest, farm, estate, coal mine, goldfield and gumfield. No other region had its activities focused so distinctly on one central hub'.²²

In the early 1860's the presence of workable coal at Drury, together with the military requirements of the time, led to the conception of a railway from Auckland to Drury with a two-mile branch line to Onehunga. It was not until 1873 that the line was opened to Onehunga, and then rapidly to townships further south until Te Awamutu was reached in 1880. By coastal vessel from the Waitemata, Auckland was linked with the northern peninsula and the east coast of the North Island, especially the new farm settlements on the coast of the Bay of Plenty, while from the Manukau vessels plied to many ports in the North and South Islands, and river steamers carried cargoes far inland up the Waikato and Waipa Rivers. Auckland was rapidly catching up on Dunedin as the most important centre of overseas trade, and was already the main point of contact with North America. Furthermore, the port was used by ships of many nations, including German, French, Russian and Italian war vessels, as a coaling station and for repairs.²³

The growth of manufacturing was affected by two additional factors during this period. Whereas up until about 1870 the fortunes of indus-

²¹ *Thames Diamond Jubilee Souvenir 1867-1927*, Thames, July 1927, p. 244. The firm moved from Onehunga to Thames in 1870.

²² Kenneth B. Cumberland and R. P. Hargreaves: 'Middle Island Ascendant: New Zealand in 1881', *New Zealand Geographer*, Vol. 12, No. 1, April 1956, p. 56.

²³ G. W. Griffin: *New Zealand: Her Commerce and Resources*, Wellington, 1884, p. 52.

trial undertakings had depended on the booms and slumps caused by events mainly within the provincial district, they now became subject not only to the prosperity of the colony as a whole, but also to the development of trade with overseas countries.

BOOM AND DEPRESSION

The boom of the 'seventies, the rapid increase of population and the improvement of communications encouraged the expansion of existing factories and the setting up of others. On the other hand, the depression of the 'eighties caused new industries to 'grow out of the low wages and sweating',²⁴ and existing industries which supplied the home market produced less in 1891 than in 1886. In the 'eighties New Zealand began to look to manufacturing as her future as well as farming — 'the exploitation of labour, the market in New Zealand and Australia, the immigration of skilled operatives, and the black outlook for farming all combined to add to New Zealand's factory production'.²⁵ As in most other centres, the Sweating Commission of 1890 found in Auckland plenty of evidence of the insanitary and inhumane conditions in factories where under-nourished and under-paid boys and girls were forced to work long and arduous hours.²⁶ Auckland shared too in the rise of exports of manufactured goods in the middle 'eighties. Industrialists were encouraged by the cheap urban labour and assisted by the change in the nature of their products to develop a considerable export market; in fact 'New Zealand was becoming a miniature England, exporting goods and surplus population'.²⁷ In 1888, following agitation for the protection of manufactured goods, a tariff was introduced to protect local clothing and footwear factories, machinery manufacturers and metal workers.

The foundations of the future wealth of the Auckland district were being laid in the 1870's when, with peace restored, the public works developments and the boom of the decade brought rich land into use in 'unconscious preparation for the export market to be opened up by refrigeration'.²⁸ In 1882, the year in which the first shipment of refrigerated meat was made from Port Chalmers, Fisher and Co. in

²⁴ W. B. Sutch: *The Quest for Security in New Zealand*, London, 1942, p. 62.

²⁵ *ibid.*, p. 68.

²⁶ 'Evidence of the Sweating Commission', *Appendices to Journals of the House of Representatives*, H. 15, 1890. Questions 1561-1568.

²⁷ Sutch: *op. cit.*, p. 68.

²⁸ W. B. Sutch: *The Long Depression 1865-1895*. Paper read to Section G, A.N.Z.A.A.S. Conference, Dunedin, January 1957, (mimeographed) p. 15.



Photos:

Turnbull Library

g. 3. The Colonial Ammunition Company's factory at Mount Eden in the late 1880's

Auckland were operating a cold-air refrigerator for local trade and ships' stores. In 1883 the New Zealand Frozen Meat and Storage Company took control of this firm, and two years later made the first shipment of meat from the port of Auckland to the United Kingdom. Although butter and cheese were exported from the provincial district as early as the 1870's it was not until the last few years of the century that the potential offered by the manufacture and export of dairy products was recognised.

In 1878 in the Auckland provincial district, there were some 278 industrial establishments which amounted to 22 percent of the New Zealand total. In the thirteen years between 1878 and 1891 the number of factories in the district increased by 106 percent, whilst the increase for the whole country was only 78 percent.²⁹ During a twenty-year period from 1870 no fewer than six out of the twenty-two firms were founded which are still in operation on the isthmus and which today employ more than 200 workers.³⁰ In addition many others were founded which, although smaller in size, have currently well-known names.

ORIGINS OF INDUSTRIAL FIRMS

Many of the industrial undertakings were started by individuals or partners as small retail concerns. Some firms grew as the result of the expansion or amalgamation of existing enterprises, for example, the

²⁹ In 1881 there were 366 factories, in 1886 508, in 1891 577, and in 1901 667. As the definition of 'manufacturing' varied at each census a correction has been applied to make the coverage of these statistics approximately the same.

³⁰ Namely *The Evening Star* (now *Auckland Star*) newspaper in 1870; R. and W. Hellaby in 1873; *The New Zealand Herald* (amalgamated with *The Southern Cross*) in 1876; the Colonial Sugar Refining Company in 1883; the Colonial Ammunition Company (formerly Whitney and Sons) in 1885; and Alex. Harvey (canister manufacturers) in 1886.



Fig. 4. Clarke's potteries on the shores of Waitemata Harbour

combination of the Parnell Soap Co. and the Auckland Oil Co. in 1882 forming the Union Oil, Soap and Candle Co. Sometimes industrialists set up elsewhere and later moved to Auckland, and occasionally Australian companies bought out local enterprises—the Kauri Timber Co., for example, formed in Melbourne, bought out several mills in the Auckland area in 1888. Most firms were owned by individuals, by partnerships, or were run as family concerns, and although only a few were founded with widespread financial backing these were usually large and important concerns such as the works of the Colonial Sugar Refining Company, or the mills set up at Onehunga by the North New Zealand Woollen Manufacturing Co. Ltd. in 1887.

Throughout the period from 1871 to 1900 the city remained the most important manufacturing area on the Auckland isthmus. Exact figures are not available until 1896 when the Department of Labour commenced to report annually on the number of persons employed in various trades in the main cities of the country,³¹ so that until this date it is necessary to rely on listings in contemporary guide-books and almanacks. It is clear that there was not only 'light' manufacturing, such as printing shops and clothing factories, within the city but also trades which are now associated with the 'heavy' industrial areas in the outer suburbs of the isthmus. From an early date breweries, engineering shops and agricultural implement manufacturing works had been established, and in 1882 there were at least eight iron and brass foundries within a stone's throw of Queen Street. Perhaps the most important of these city industries was that connected with the manufacture of leather. The tanneries on the outskirts of Auckland were

³¹ 'Report of the Department of Labour,' *Appendices to Journals of the House of Representatives* 1896, H. 6, pp. 39-67.

much larger than those elsewhere, and the leather and leather products, sent largely to Wellington and other southern towns were 'fast expelling imported goods from the colonial market'.³²

FACTORIES ON THE FORESHORE

By 1886 industrial buildings stretched almost continuously along the waterfront. To the east of the Railway Wharf there was a meat-freezing works, a sash and door factory, a shipbuilding and boiler-making yard, and a brick works, while to the west of Queen Street Wharf there were the extensive premises of two timber firms, an asphalt works and six boat-building yards.³³ In 1888 yet another prominent building was added to the waterfront scene when the large mill of the Northern Roller Milling Company was built in Quay Street. The location of these undertakings along the foreshore reflected the importance of water communications. Timber was still rafted down the Waitemata Harbour to the mills in Freemans and Mechanics Bays, and wheat, brought by coastal vessels from Canterbury, was milled virtually on the quayside. There was still sufficient demand to keep sixteen boatbuilding yards in operation in the 'eighties, although the number declined towards the end of the century. The foreshore was gradually reclaimed and being flat land it formed attractive industrial and commercial sites, as well as being suitable for the railway station and yards and the graving dock.³⁴ Behind the waterfront areas in Freemans Bay and Mechanics Bay industrial buildings became more numerous, and after 1881 there was 'a slight withdrawal of residences from the northern fringe of Freemans Bay as industrial development intensified and expanded'.³⁵

In the suburbs surrounding the city there was a continuing expansion of industry. The development of Newmarket was hindered by the erection of toll-gates in 1866, but after their removal less than a decade later the borough grew commercially and industrially, more particularly after the railway workshops were erected in 1884. It was the railway, too, that attracted industry to the road district of Mount Eden, for by 1886 there were two timber mills and an ammunition factory in operation.

³² Brett's *Auckland Almanack*, 1882, p. 103.

³³ Brett's *Auckland Almanack*, 1886, p. 110.

³⁴ By 1900 115 acres of foreshore had been reclaimed. After the demolition of Point Britomart the station was moved westwards in 1885 to the site on which the Auckland Central Post Office now stands. The graving dock opened in 1878 was abandoned in 1913.

³⁵ Pownall: *op. cit.* p. 118.

Until about 1880 most of the brick and pottery kilns had been built close to the Whau Stream, but when the railway was opened to Henderson the kilns were built beside the line and the products railed to Auckland. By 1898 J. J. Craig had a brick and pottery works at Avondale which was claimed to be 'the largest in the colony having a capacity of 90,000 bricks per day'.³⁶ The tannery of Messrs Gittos in Avondale was forced to move in the late 'eighties because of the difficulties of waste disposal, but in 1888 another tannery was set up by E. Astley and Son on the banks of the Whau Stream. The site chosen was the furthest point reached by tides up the stream so that the fresh water could be obtained at one end of the tannery and the effluent could be discharged into tidal water at the other.³⁷

OUTLYING INDUSTRIAL ACTIVITIES

By the 'nineties much of the easily-worked timber on the Waitakeres had been felled, and the timber firms turned their attention to the excellent, but less accessible stands of timber further back in the ranges. Although timber-working was the main occupation in the Waitakeres a few other industries were set up from time to time including a flax-mill, a heel and toe-plate factory, a brick kiln and a glue works. Further to the north Helensville prospered when a railway was built to Riverhead thus linking the Kaipara and Waitemata Harbours. By 1884 the population exceeded 500, having doubled itself in three years,³⁸ and the industries carried on included timber milling, flour milling, brick making, fancy soap manufacturing and fish preserving.

On the south and southeast of the isthmus it was in the borough of Onehunga in particular that several of the largest enterprises were founded. At various times during the 'seventies and 'eighties works were set up here to smelt local ironsand, but all attempts failed. More successful were factories established to manufacture woollens, glue and cardboard boxes. John Bycroft added a slaughterhouse and bonemill to his flourmill and biscuit factory in 1870, and when this firm moved to city premises in 1880 the disused site was taken over and converted into a tannery by William Sutherland.

At Panmure a tannery commenced operations in 1876 having moved from its original location in the city. George and Barton Ireland had

³⁶ *New Zealand Herald*, Special Supplement, July 1898.

³⁷ For a description of the difficulties of setting up such an enterprise in the 1880's see John E. Astley: *The Astley Family 1856-1955*, privately published, Auckland, 1955.

³⁸ *Brett's Auckland Almanack*, 1884, p. 125.

chosen this new site well, for it was adjacent to the tidal lagoon of Panmure Basin, which not only facilitated cheap transport by water to and from the wharves at Auckland, but also provided an outlet for the tannery effluent. Labour was available close at hand from the village of Panmure, mostly men descended from the Royal New Zealand Fencibles who had been settled there in 1848, and when the tannery and fellmongery closed about 1900 some three hundred employees were thrown out of work.

The only establishment in the 'eighties at Penrose, later to become one of the most industrialised areas in Auckland and in New Zealand, was a depot of coal for the supply of naval ships at the junction of the branch line to Onehunga and the main line from the south to Auckland. Two miles further south at Westfield there were by 1886 the works of the New Zealand Frozen Meat Company and the Union Oil, Soap and Candle Company. The former company also manufactured superphosphate of lime and chemical manures, and similar products were made at the works of Kempthorne-Prosser built nearby in 1896. There is no definite reason why Westfield was chosen for the location of the meat-freezing and chemical industries:³⁹ it can only be surmised that the main considerations were the accessibility by rail both to Auckland for export by ship and south to the farmlands being opened up in the Waikato, the availability of water from springs and wells, the easy disposal of waste products into the Manukau Harbour, the refusal of local bodies to allow such noxious undertakings near residential areas elsewhere on the isthmus, and the cheapness of the land.

³⁹ Mr. G. G. M. Mitchell suggests that the area became known as 'Westfield' because the first freezing works was established there largely as a result of the efforts of Joseph Banks who was born on a farm named 'Westfield' a few miles east of Liverpool, England.



Fig. 5. Cramped conditions in an Auckland saddlery factory about 1890

On the northern shore of the Waitemata there was still relatively little industrial development. A sawmill had been erected at Devonport by 1883 to prepare timber brought from Wade for the two ship-building yards in the vicinity. At the beginning of this year the area around Chelsea was described as 'a wilderness', but during the following months the works of the Colonial Sugar Refining Company was erected, together with a village to house the employees. The site selected for these works included a small promontory which jutted out into deep water, and a small inlet into which emptied a perennial fresh water creek. Thus the company had its own freehold estate, a deep water harbour for shipping, excellent ground for building the works, a supply of fresh water, and a supply of clay suitable for making into bricks.⁴⁰

1901-1936

By 1901 the outlines of the future growth of Auckland had become apparent. The provincial district stood foremost in the colony in terms of population, and there were already indications that its rapid rate of industrial development would far outstrip those of the southern provincial districts. The population of the city and suburbs was 67,226 at the time of the 1901 census, 10,000 more than Christchurch, the next largest urban area. In some respects the district was not yet pre-eminent in the industrial pattern of New Zealand. Although it had more factories and a higher value of land, buildings and machinery engaged in manufacturing, Auckland did not employ as many workers or utilise as great a horse-power as the factories of Otago, nor did it have as high a value of output as those of Canterbury. By 1905, however, the Auckland provincial district, with more than 30 percent of the workers and 21 percent of the factories, had firmly established its position in the industrial development of New Zealand.

Several factors gave impetus to the growth of Auckland during the 'nineties and early years of the twentieth century. In a city dependent upon a province so much engaged on the extraction of gold, gum and timber severe fluctuations in commercial prosperity had been experienced. However, Auckland was rapidly becoming less dependent on these extractive resources, and a period of steadier industrial and commercial development ensued.

⁴⁰ See A. C. Isaacs: 'Sugar in New Zealand', in *South Pacific Enterprise* 1956, p. 200. (Published by the Colonial Sugar Refining Company Limited.)

LOW WAGES AND LIVING COSTS

Paradoxically, one reason in particular reinforced the wave of prosperity—the low wages which were paid in Auckland during the late 'nineties and early years of this century. Between 1895 and 1911 employment in factories rose by 125 percent in Auckland, and only 77 percent in the rest of the country. In no other part of the colony were wages so low as those paid in Auckland,¹¹ but nowhere else was the cost of living so low as in Auckland.¹² In fact the average standard of living of the workers was higher than elsewhere. Whereas Auckland manufacturers had few shortages of labour, those in the southern centres were compelled to bid for a diminishing supply of workers. In particular, the products of many Auckland factories were able to compete on much more favourable terms with those of overseas manufacturers on the local market.

The export of refrigerated meat and dairy produce which had commenced in a small way in the 'eighties increased rapidly during the first decade of the new century. The works, which formerly belonged to the New Zealand Frozen Meat and Storage Company, were taken over by R. and W. Hellaby Limited in 1903, and two years later the Southdown works of the Auckland Farmers Freezing Company was opened for the slaughter of stock for export. Within a decade another works for W. and R. Fletcher and Westfield Freezing Company was under construction, and this opened in 1916, later to become the largest undertaking of this kind in New Zealand.

The development of the Waikato, especially after 1900, and to a lesser extent of Northland, led to an increasing demand for manufactured products such as building materials and furniture, milking equipment for the dairy, and chemical fertilisers for the land. As most of the export produce of the Waikato passed over the wharves at Auckland a close association was established between the farmers and the commercial and industrial firms in the city. Furthermore, the employment in the meat-freezing works, dairy factories and chemical-fertiliser works in the urban area itself created a further demand for the building and construction trades, for services and, in turn, for additional manufacturing output. One further factor was influencing

¹¹ See *New Zealand Official Year Book*, Wellington, annually from 1893. Table of average rates of wages in each provincial district.

¹² See *Prices—An Inquiry into Prices in New Zealand 1891–1919*, Wellington, 1920, p. 94. Tables show index numbers of the food groups and rent for Auckland, Christchurch, Wellington and Dunedin 1891–1914.

development at this time; the long narrow shape of New Zealand, and its division into two main islands, made it difficult for a manufacturer to decide where to locate a factory. There seems little doubt that the rapid increase in the population of Auckland, its apparent prosperity, its unknown potential and its overseas trade connections all created conditions attractive and favourable to additional enterprise.

INNER CITY CONGESTION

The growth of new factories did not greatly alter the pattern of industrial location already set out during the latter part of the nineteenth century. For the most part developments were not spectacular, but rather a slow and gradual process of filling-in sites left untouched. Here and there industrial sites were created by tearing down some of the older deteriorating houses, as in Freemans Bay, and replacing them with two or three-storeyed factory buildings. During the period between 1901 to 1936 there were few locational movements in the isthmus. Instead, the increasing demand was met by jamming more and more machinery and employees into many-storeyed, inadequately-lit and poorly-ventilated buildings which were often quite unsuitable for use as factories. The majority of them were to be found crowded along the old, narrow, inadequate city streets, hidden a few hundred yards behind the facade of the main thoroughfare of Queen Street.

There was little demand for land in the undeveloped suburbs, apart from that by one or two businessmen who were scoffed at at the time for their foolishness, and who later proved to be more far-sighted than the rest. Apart from the noxious industries at Westfield and in the eastern part of the borough of Onehunga, manufacturers took an interest in only one area outside the city for heavy industry. Penrose, which at the beginning of the 'twenties was merely a flat waste of grass, scrub and stony outcrops too infertile to cultivate, was recognised as an ideal site for heavy industry. In 1921 the pioneer firm, Booth Macdonald and Co. Ltd., manufacturers of farm machinery and implements, established the first factory in the area near the junction of the Onehunga branch railway line. This was joined the following year by a glass works, and later, by factories producing sandsoap, concrete and steel pipes and rubber products.

One of the most spectacular changes was the development of the harbour; the whole appearance of the waterfront changed as the foreshore was gradually reclaimed, the number of wharves and associated

buildings increased and the facilities expanded. Altogether, by 1936, land actually reclaimed, or in the process of reclamation, amounted to 350 acres, and of this area two-thirds had been won since 1900. The Auckland Harbour Board owned this land, and areas not required for the board's purposes were leased to industry. Thus, land suitable for heavy industry was made available within a few hundred yards of the heart of the city, and most of the demands of engineering, boiler-making, shipbuilding and similar industries could be satisfied without seeking large areas of undeveloped and comparatively inaccessible land elsewhere. Some of the firms long-established on the waterfront took new sites on the reclaimed land, particularly shipbuilders' yards which had to be on the water's edge.

After 1900 the rate of industrial growth in Auckland was steadier than in the periods either before the turn of the century or after 1936. Such circumstances as the first World War and the depressions of the 'twenties and 'thirties left their impression on the industrial development of Auckland as they did similarly on manufacturing throughout the country. In keeping, too, with the gradual expansion of the economy throughout the country, Auckland gained its share of the newer kinds of secondary industry. By 1936 there were in the provincial district about one third of the country's factories and industrial workers, and they produced about the equivalent proportion of the total value of the dominion's factory output.⁴³

A new phase of development took place after 1936. The Industrial Efficiency Act passed that year, together with the control of imports and regulation of exchange which followed in succeeding years, marked a new policy of economic nationalism by the government. The stimulus given to manufacturing was general throughout the dominion, but in Auckland it had repercussions which are still creating problems for the town-planner. No longer could manufacturers meet the demands of the country from their inadequate premises, and in consequence they began to decentralise, to spill out, from the city to other parts of the isthmus.

⁴³ *Census of Factory Production*, Wellington, 1935-1936. There were in the Auckland provincial district 1,801 factories, employing 29,883 persons, and producing an output valued at £34,849,000.

SANDSPITS OF THE OTAGO COAST

EILEEN L. ELLIOTT

THE COASTLINE of Otago, with its alternation of rocky promontories and deep inlets, is sharply distinguished from the neighbouring stretches of Southland and Canterbury, where the shoreline has been actively prograded by the growth of alluvial fans and deltas. Otago displays the classic features of a coast of submergence, only submaturely modified. Although numerous streams discharge into the inlets, the catchment areas are typically rather small—the Catlin, Waikouaiti and Shag—while the great rivers—the Clutha, Taieri and Tokomairiro—have left behind much of their gravel load in their intermontane basins, and have only restricted outlets to the sea. The coast of Otago, south of the Waitaki fan, therefore lacks both the masses of greywacke gravel poured down by the glacier-fed Canterbury rivers and the wide bays which originally allowed the building of large deltas by the Maitai and Aparima in Southland.

Nevertheless, the erosion of the schist uplands of central and eastern Otago, especially by the Clutha and its tributaries, has provided ample fine sand for the building of spits which partially close the mouths of all the larger inlets, and the tombolo which joins the Otago Peninsula to the mainland. It is a striking anomaly of these spits that they appear to have grown in the opposite direction to that which would be expected by comparison with similar features elsewhere. The general direction of the coast is from southwest to northeast, though the indented character causes many local variations. The normal offshore current and the strongest storm-waves come from the southwest; yet, almost without exception, the spits project from the headlands nearest the northeast, and the break occurs at the 'southwestern' side of the inlet. The exceptions can usually be ascribed to peculiar local conditions, as in the double spit at the mouth of the Waikouaiti River.

This contrasts sharply with the gravelly coast of the Canterbury Bight immediately to the northeast, where, though the coastline is markedly smooth, currents and winds are much the same; here, almost every river mouth is diverted for a considerable distance towards the northeast by a spit projecting from the southwestern side. The

difference cannot be solely due, however, to the presence of headlands in Otago breaking the line of the crest and perhaps affording shelter from the southwest, for the coastline presents many variations of aspect. A more universal factor must be sought.

GROWTH AND FORM OF THE SPITS

In the ensuing discussion, attention is focused on the stretch of coast from the mouth of the Clutha to Oamaru. In this area it has long been recognised that the fine sand which constitutes the chief beach-building material has been brought down for the most part by the Clutha River and swept northeastwards by the offshore current. This current, which commonly reaches a speed of two knots off Cape Saunders, is more than adequate to transport the sand, which averages 0.2–0.4 mm. in diameter. Its presence in depths up to 70 fathoms has been demonstrated by soundings¹ and in quiet weather it is deposited in every nook and cranny in the stretches of high cliffs.

There are only one or two localities where the beaches contain coarser constituents. The volcanic rocks of the Dunedin district (mainly basalts, phonolites and trachytes) front the sea in high cliffs, but in spite of rapid marine erosion their wastage does not contribute greatly to local beach materials. The irregular boulders loosened from the cliffs are quickly ground down into fine mud which is drifted out to sea.

Although vast quantities of material are thus brought to the area from the southwest, the actual fashioning of the spits must be examined in the light of the interplay of varying wave action and the exact form of the convoluted coastline, together with the work of wind in building dunes from sand blown from the foreshore. Though their direction may seem to present an unusual feature, the spits are in no sense abnormal in form, having grown out in the usual fashion from the headland to which they are attached. No experiments were undertaken to test the direction of the sand movement, but the drift towards the distal end is strikingly demonstrated by the growth of Aramoana Spit, at Otago North Heads, and by the banking up of sand against the western side of the mole since its construction in the 1880's and lengthening in 1941 (*Fig. 2*). Both the sand dunes on the more seaward side of the spits and the marshes behind show a gradual succession of plant communities; in the case of the dunes from scattered plants of

¹ P. Marshall: 'Report on Soundings and Dredgings off Otago Harbour,' *Unpublished Report to Otago Harbour Board*, 1931.

Desmoschoenus spiralis or marram grass to a matted cover of native scrub or the exotic yellow lupin, and in the case of the marsh from sparse plants of *Salicornia* to a close salt-meadow turf of *Selliera*, *Samolus*, and *Cotula* species, and thence to flax-swamp. The general 'sima' shape of the beach is also a normal feature, brought about by the difference in power of waves from various directions.²

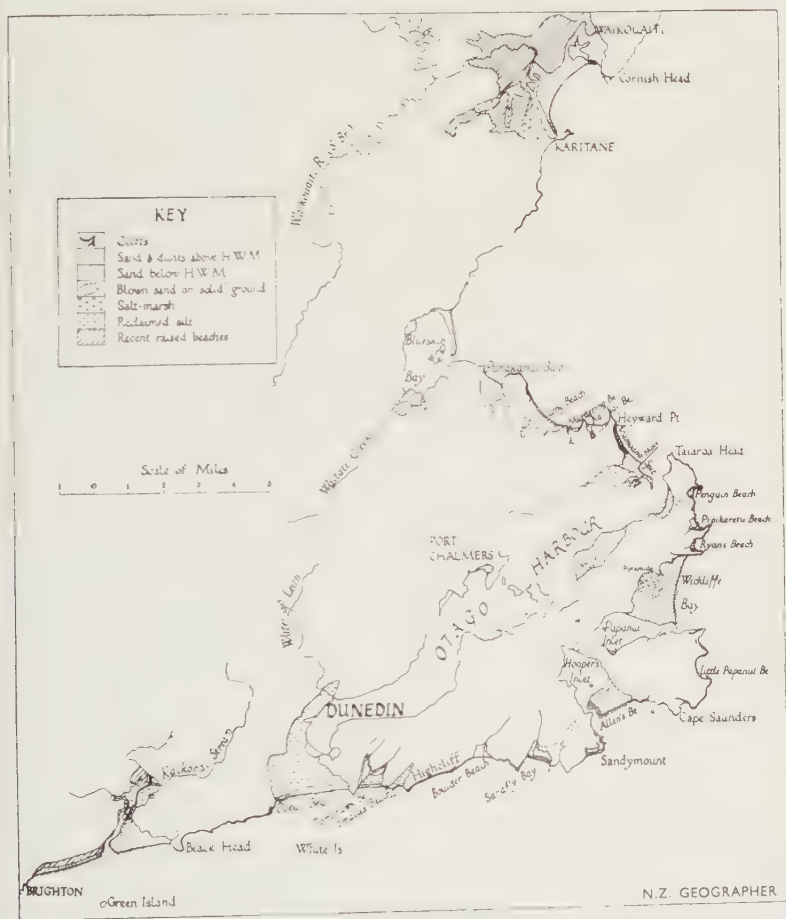


Fig. 1. Portion of the Otago coast showing nature of shoreline

WIND AND WAVE DIRECTION

The situation of the eastern coasts of New Zealand differs in two important respects from those fringing the narrow seas around Britain, and is more nearly comparable with California. In the first place,

² J. N. Jennings: 'The Influence of Wave Action on Coastal Outline in Plan,' *Austr. Geogr.*, Vol. 6, No. 4, January 1955, pp. 36-44.

fronting on to the open Pacific, the coast is perennially subject to heavy swell rolling in from the ocean. In the second place, thousands of miles of open sea stretch in every direction, and considerations of relative fetch do not enter. Hence the nature of the waves and their effect on the coast are highly dependent on the interplay of the directions of swell and wind.

TABLE I
ANNUAL PERCENTAGE WIND FREQUENCIES

SPEED M.P.H.	N	NE	E	SE	S	SW	W	NW	UNDER 4 M.P.H.
TAIAROA HEAD									
UNDER 4									25
4-15	15	7	3	2	6	11	1	2	
16-31	6	2	—	1	3	12	1	1	
32-46	—	—	—	—	—	2	—	—	
TOTAL	21	9	3	3	9	25	2	3	25
WAIKOUAITI 1937-1945									
UNDER 4									40
4-15	3	19	2	2	3	14	2	2	
16-31	1	2	—	—	1	6	2	1	
32-46	—	—	—	—	—	—	—	—	
TOTAL	4	21	2	2	4	20	4	3	40

The table above, provided by the New Zealand Meteorological Service Office, gives the annual percentage wind frequencies by direction and force for Taiaroa Head and Waikouaiti. Of the two, the record at Taiaroa Head is based on a longer period, but owing to local effects of relief a general northeasterly airflow on the Otago coast is usually recorded as a northerly wind at the Heads. It is clear that the south-westerly is the prevailing fresh or strong wind on the Otago coast, and that most of the gales come from the southwest. The next most frequent fresh or strong wind is the diametrically opposite north-easterly, and if the lighter winds be taken into account this is in fact

the commonest wind direction; winds of less than four knots generally tend to be northerly or northeasterly, but their value for statistics is vitiated by the prevalence of land and sea breezes in summer. Light winds are naturally commoner at Waikouaiti, which is much more sheltered than Taiaaroa Head.

While the strongest winds on the one hand, and the commonest on the other, blow along the general direction of the coast, (though in contrary senses) the ocean swell tends to approach more nearly perpendicularly to the coast than is the case with waves generated in narrow seas. Because of their length, the waves are early affected by refraction, and by the time they reach the shore have swung round almost parallel to it. Observations on several occasions showed that the period of waves before breaking normally varied from 10.5 to 13 seconds, giving a deep-water length of about 560–860 feet, which meant that the waves began to 'touch bottom' at 280–430 feet.³ Some distance offshore, however, the swell normally runs from the sector between southeast and south, a natural result of the generation of the original storm-waves in the Southern Ocean rather than in the Pacific proper.

WAVE HEIGHT

Although both the common winds cross the offshore waves obliquely, the southwesterly is to some extent a following wind and the northeasterly a headwind. The main result of this seems to be the building up of wave-height by the former and a lowering by the latter. No significant difference in wave length and period was noticed under opposing wind conditions, except at the extremes; during the southwesterly gales the period is appreciably greater, and if the northeasterlies are particularly strong, the period does appear to be reduced. But whereas the wave-height before breaking is some 6–8 feet during fresh southwesterly winds, it is normally only 1–3 feet with northeast or north-northeasterly winds. The southwesterlies, therefore, favour the development of steeper, and the northeasterlies of flatter wave-profiles. Since wave energy varies with the square of both height and period, the southwesterly seas (or rather the seas influenced by southwesterly winds, since they may be refracted out of a southwesterly position) are the more powerful.

³ Calculated from the formula $L=5.12 T^2$, given in 'Summary of the Theory of Oscillatory Waves', *Technical Report No. 1*, 1942, Beach Erosion Board, Washington.

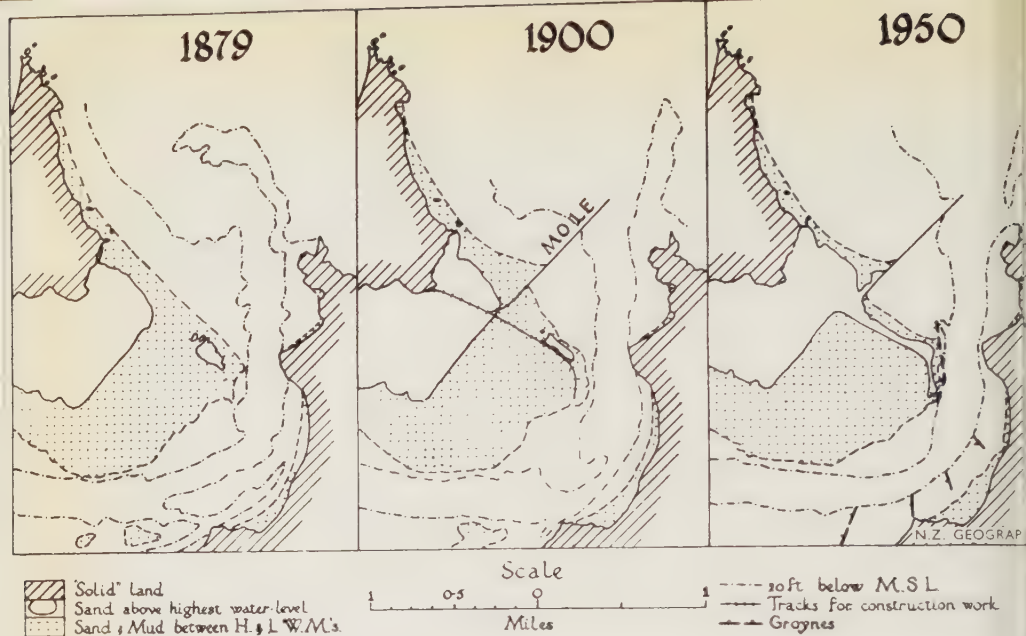


Fig. 2. The growth of Aramoana Spit at the entrance to the Otago Harbour

WAVE ACTION AND LONGSHORE TRANSPORT

The waves approaching the coast are thus mainly swell modified by the action of the winds, not waves directly generated by these winds. Because refraction is seldom if ever complete, there always remains some longshore impulse, though in this area the opposing forces are somewhat delicately balanced. As a consequence of the almost normal approach of the swell, the outline presented by the seaward margin of the spits represents a partial smoothing of the coastline, replacing deep embayments by gentle sags; they do not project at an angle to the general run of the coast, as happens when dominant waves approach more obliquely, e.g. on the Cardigan Bay coast of Wales.

The superior power of the steeper 'southwesterly-modified' waves is amply demonstrated by the movements of coarse material both on the Canterbury coast, unbroken by rocky headlands, and in three localities on the Otago coast itself. All three lie to the south of Dunedin, where the coast happens to be particularly open to southwesterly winds and waves.

In two places a particularly tough, well-jointed basalt provides small rounded boulders, 4 inches to 2 feet in diameter. Black Head consists of a mass of black columnar basalt, let down by faulting against the creamy-white Caversham sandstone which forms the cliffs to the east. Because of the difference of colour, the junction is extremely clear. To the northeast, there is a trail of black boulders for some 400 yards,

whereas on the Kaikorai side the boulders straggle only 50 yards or so west of the last low outcrops. It should be noted, too, that here the 'northeastward' movement takes place in spite of the partial shelter afforded by the projection of Black Head.

Northeast of the great cliffs of Highcliff, the foreshore of the aptly-named Boulder Beach is almost entirely covered by similar boulders; they are virtually absent from Smailes' Beach to the west of the cliffs. At Boulder Beach the small creek enters the sea at the northeastern end of the beach, giving additional proof of the prevailing movement of the beach material.

COARSE AND FINE DEPOSITS

Southwest of Brighton there are large deposits on the beach of a much coarser sand, 1-2 mm. in diameter, which has come from the Taratu beds, of late Cretaceous age outcropping near the coast in a few places between the Taieri mouth and Brighton. Comparison of outcrops and beach deposits in 1954 showed that the thick deposits of coarse sands trailed northeastwards from the outcrops everywhere except in the section immediately adjacent to the Taieri River, where sand from one outcrop has moved southwards as far as the river mouth, as well as northwards (*Fig. 3*). This, however, is not unexpected, since it is just here that the shore is almost completely sheltered from the southwest by Taieri Island and the sandbar joining it to the mainland.¹

The case of the fine sands is, however, quite different, since they can be moved quite readily by less powerful waves. Indeed, the southwest-pointing spit at the mouth of the Kaikorai occurs so close to both Black Head with its boulders, and the Taieri Mouth-Brighton beach with its coarse sand, that it is tempting to think that coarse and fine materials may have a resultant movement in opposite directions on virtually the same stretch of beach—the coarse materials being affected only by the powerful waves, and the fine by the weaker ones as well.

Since it is generally accepted that agents of erosion and transport accomplish more work in a short period of storm than a longer period of less drastic conditions, it is necessary to examine more closely the action of the two types of wave to throw light on the apparent superiority of the weaker ones in moving fine material. The breakers of the

¹ This bar lies to the north of the river outlet, not to the south, as is erroneously shown on the one-inch topographical sheet.

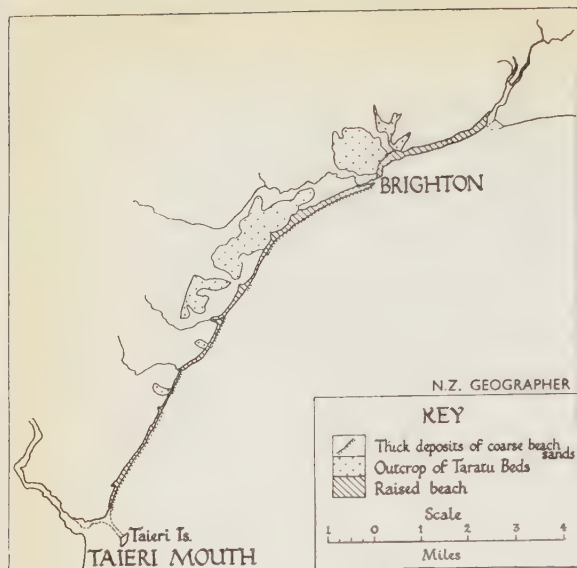


Fig. 3. Terrain features of part of the South Otago coast

Otago coast, whatever the wind direction, tend to be predominantly of the 'plunging' type, a fact reflected in the absence of safe surfing beaches characterised by 'spilling' breakers. During the quieter spells of northerly weather, however, the danger of rip currents is at a maximum, pointing to an overall transport of water shorewards which can only be disposed of in this fashion.

In the absence of observations from precise levelling, what follows can be only tentative. Nevertheless, observations on fixed objects—the stakes on Ocean Beach and the wreck at Ryan's Beach, for example—confirm the popular impression that the foreshore is cut away during spells of southwesterly winds. At the same times the line of foredunes suffers erosion on exposed beaches. It is during the quieter spells of northeasterly weather that the beach is built up. In other words, the steep waves comb down the beach, while the flatter ones build it up. The waves most concerned in the *construction* of the spits are therefore those acting during periods of northerly and northeasterly winds.

This conclusion is in line with a growing body of evidence overseas that onshore winds encourage erosion of a beach, and offshore winds, deposition. The form of the Otago coast is too complicated to apply the terms 'onshore' and 'offshore' to more than a small stretch at any one time. A comparison may, however, be legitimately drawn between the results described by these workers and those observed on the Otago coast, because it is precisely the steepening of waves by onshore winds which is held responsible for the accelerated erosion of beaches, and the flattening by offshore winds for its upbuilding.

There are two other factors which may help to turn the balance in

favour of the flatter 'northeasterly-modified' waves. The first is the possibility that their length is sometimes rather shorter, in which case they would be rather less affected by refraction than the 'southwesterlies', and have a greater longshore impulse. The second is the existence of submarine valleys, continuing the line of the coastal inlets, proved by recent soundings from H.M.S. *Lachlan*. In at least two cases—off Hoopers Inlet and Purakanui Bay—the deeper portions of the valleys lie somewhat to the northeast of the centreline of the modern inlets, and since waves can travel unimpeded along the valleys for a longer time before refraction takes effect, the wave front approaching the beach will tend to be turned slightly farther round towards the south. Again, this gives an added impetus to 'northeasterly' waves.

LOCAL VARIATIONS IN FORM

The exact form of the spits varies from place to place with the shape and direction of the main coastline. With forces so nearly balanced it may require just a small advantage one way or the other to tip the scales in that direction. Thus there occur occasional northeast-pointing spits, as at Stoney Creek, near Palmerston.

A detailed study of individual spits would show the extent to which the various factors are operative. Most of the more prominent spits occur in places relatively sheltered from the southwest, especially just to the north of Otago Harbour and at Wickliffe Bay. An excellent example is the deep Blueskin Bay, sheltered from all but northeasterly and northerly waves. At the same time, the beach material is particularly fine and muddy, containing more local silt than usual, and thus more tenacious and less liable to be blown into dunes. The spit is correspondingly long and narrow.

On the other hand, some of the beaches on the south side of the projection of Otago Peninsula show just as uncompromisingly a prevailing drift taking place in northeasterly weather—the spit at the mouth of the Kaikorai and Allens Beach at the mouth of Hoopers Inlet. Some of the smaller beaches exposed to the southwest do show movement towards the east, as at Sandfly Bay and Boulder Beach (the latter having the added factor of coarse material). In general, the larger the inlet to be closed, the greater is the tendency for it to reflect the influence of northeasterly conditions.

The double spit near Waikouaiti is one of the interesting variations on the general theme. The rocky promontories of Cornish Head and

Karitane enclose a large, almost circular, sheltered space in which accumulation has been aided by the very considerable amount of detritus from the basins of the combined North and South Waikouaiti rivers, and by recent uplift, shown by extensive raised beaches (*Fig. 1*). This material has been fashioned into the double spit lying between the mouth of the Waikouaiti and a lagoon near the township which receives the drainage of a small creek from the northeast. Such a form is obviously due to the extreme recurvature of the 'solid' coastline: the enclosing headlands cut off the northern end of the beach from all but southwesterly winds, and the southern end from everything but northeasterlies.

Differential movements of the land have also caused variations in spit form at Wickliffe Bay, where raised beaches and old stacks demonstrate an upward movement of some fifteen feet. Here emergence has aided rapid progradation of the shore, with the resulting production of an exceptionally massive spit.

MAPS OF SURFACE WINDS IN NEW ZEALAND

CHARLES B. McINTOSH

WIND, by its persistence and frequently high velocities, is a significant element of New Zealand climates. The close-textured grids of shelter belts, planted as protection for livestock and pastures, are major features of the landscape of lowland areas, yet surprisingly few attempts have been made to map the patterns of surface winds or to assess the role of wind in regional climatology.¹ The purpose of this article is merely to present and describe four maps of surface winds and to pose some questions. Discussion and analysis must be deferred. Statistics have been gathered from sixty-four stations for a twenty-year period. Data from fifty of these stations have been summarised and presented in monthly maps for October, January, April and July. Wind observations, with a few exceptions, are made in New Zealand stations at 9 a.m.

THE OCTOBER PATTERN

The October map represents a spring month. The first impression gained is one of complex lineation for prevailing wind directions. Northwest, as a dominant direction, stands out almost immediately. These northwest winds are important over much of central South Island and are also evident at such North Island stations as Wellington, Palmerston North, Pahiatua, Onepoto and Gisborne. Northeast winds are prominent at Nelson and in coastal Canterbury. Southwest winds are found in southern South Island and over most of the Auckland province. Westerly winds are more limited in incidence, being confined to the Wanganui and Taihape area in the north of the Wellington province and to isolated points in the Auckland province. North, south and southeast directions are dominant only at isolated stations. East is the only direction not represented as the dominant wind at a single New Zealand station in October.

A closer look at the heterogeneous character of the wind reveals,

¹ See, however, three maps of wind direction and velocity in I. E. M. Watts: 'The Relations of New Zealand Weather and Climate: An Analysis of the Westerlies', *New Zealand Geographer*, Vol. 3, No. 2, October 1947, pp. 115-129, and the discussion of winds in B. J. Garnier, (Edit.), *New Zealand Weather and Climate*, New Zealand Geographical Society Publication, Miscellaneous Series, No. 1, 1950, pp. 47-51.

OCTOBER SURFACE WINDS

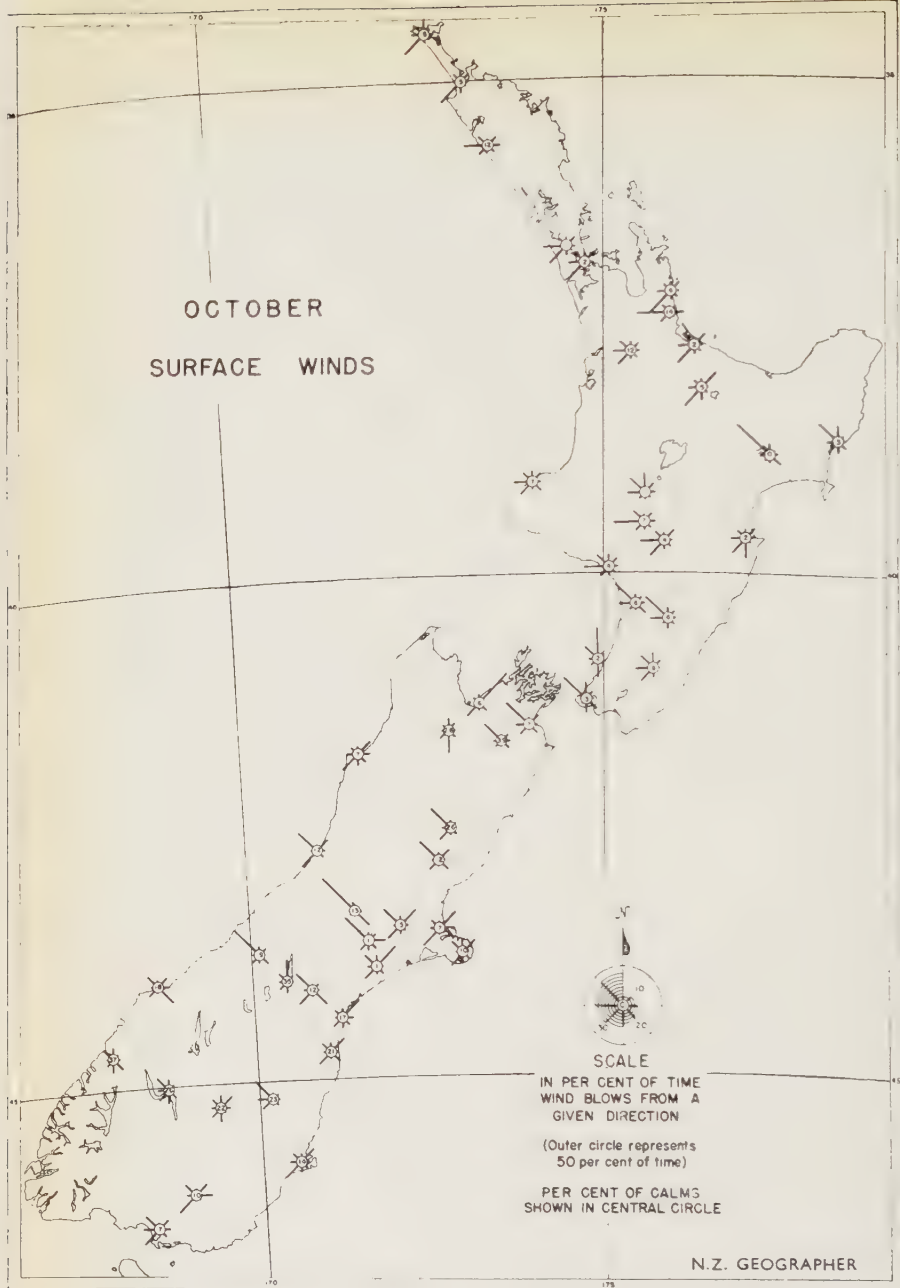


Fig. 1. Wind directions in October

however, similarities in the patterns of localised areas. Most of the stations in Northland and Auckland have the highest percentage of their winds from the southwest and west. A small area in the northern part of Wellington province has a dominant west wind and station-pattern similarities. The two stations in central Wellington province with their northwest winds also have similar wind-rose patterns. Along

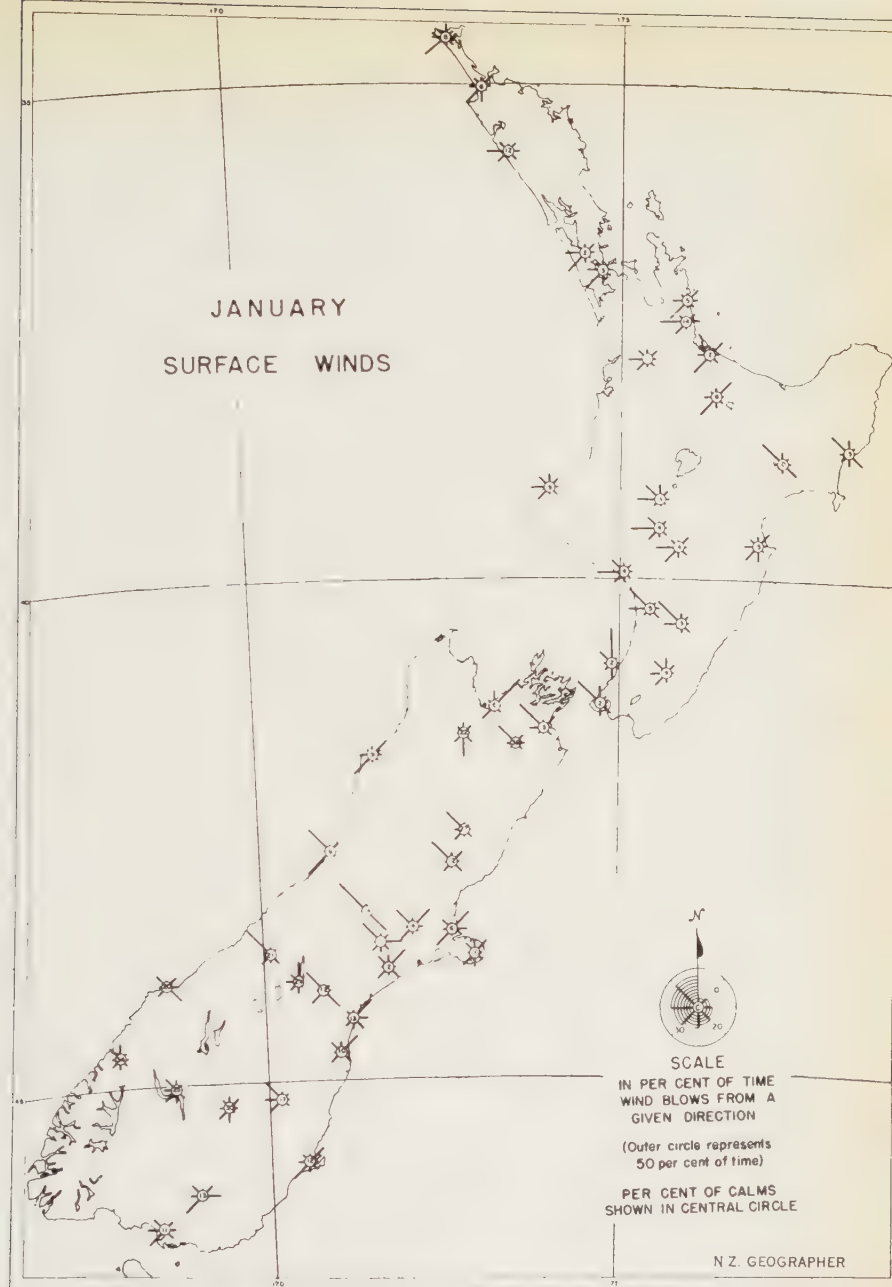


Fig. 2. Wind directions in January

the coast of Canterbury and Otago northeast winds are most important, although southwest winds compete with northeast winds at some stations. Southwest winds appear to be dominant in Southland. A high percentage of calms is the most characteristic feature of stations in Central Otago.

In summer, as represented by the January map, the complex lincation

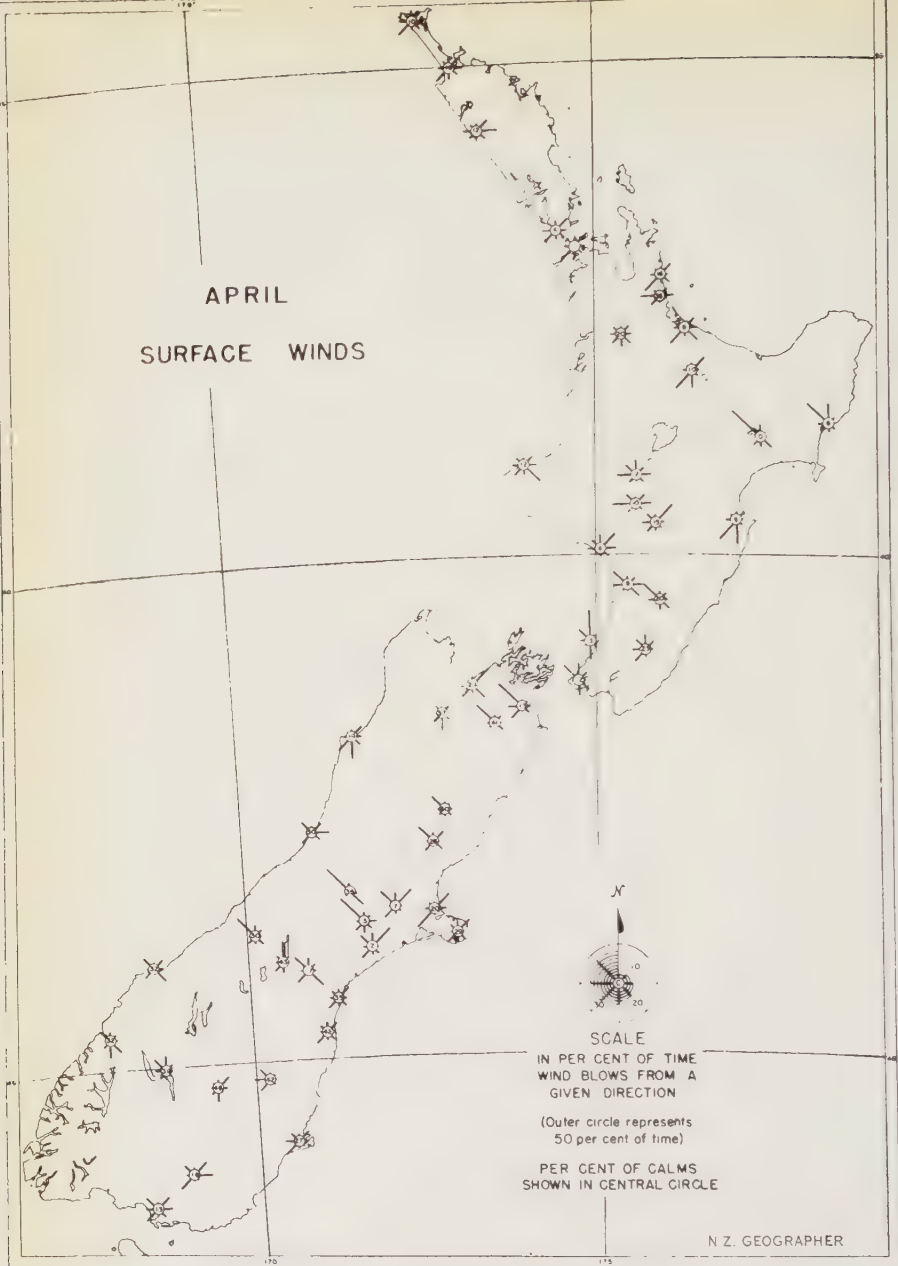


Fig. 3. Wind directions in April

of wind directions is again present. Again the regional differences are found as in the October map. Southwest winds are noticed in the Auckland province. The west wind dominance is still present in the northern part of the Wellington province. Northeast and southwest winds are once more evident along the east coast of the South Island. Calms still characterise Central Otago.

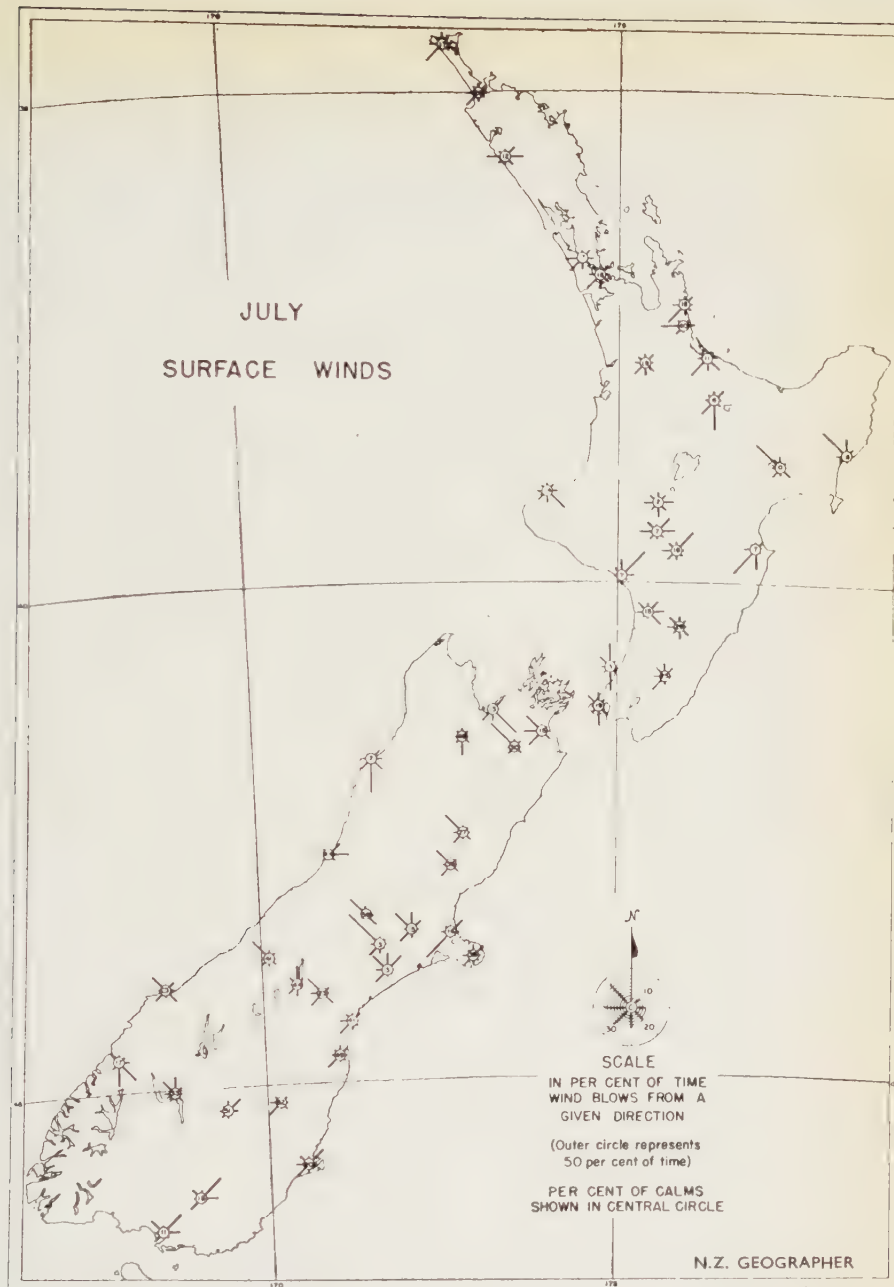


Fig. 4. Wind directions in July

In autumn, as represented on the map for April, there is still no overall uniformity in predominant wind directions. Some changes from the prevailing characteristics of the spring and summer maps are to be observed. Firstly, winds on the west coast of the South Island with the exception of Jackson Bay, are now coming from the interior rather than from a westerly direction as observed on the previous

maps. Secondly, the northern part of Wellington province is no longer an area of conformity in station patterns. West-wind influence has diminished, and in two cases, at Wanganui and Taihape, northeast winds have taken over. Thirdly, there is a tendency towards a higher percentage of calms than in spring or summer. April is the calmest of the four months mapped for sixteen of the fifty stations plotted on the maps. The increase in the number of calms is distributed quite evenly over the entire country.

Despite these differences, some semblance of common patterns is to be observed. Most stations in the northern half of the North Island have dominant southwest winds. The east coast of the South Island still has a predominance of northeast and southwest winds, and a large number of calms is still found in Central Otago stations.

JULY WIND PATTERNS

The July map depicts winter conditions. Much of the regional similarity of wind patterns has now returned to the northern part of Wellington province. The prevailing winds in this area have now changed to the northeast, a decided shift from the west winds noted in the October and January maps. Other areas of common wind patterns are still found in Northland, along the east coast of the South Island and in Central Otago. On the other hand, dominant winds at Nelson are now from the southeast rather than from the northeast; most west coast stations on the South Island, as in the April map, have a high percentage of their winds from the interior rather than the open sea; twenty-seven of the fifty stations have the greatest number of calms in July.

CONCLUSION

A number of major characteristics of New Zealand surface wind patterns as revealed on the four maps may be stated in summary. Firstly, there is great diversity in prevailing wind directions over the small area of the country. Secondly, there are definite seasonal contrasts, not only in the direction of prevailing winds but also in the frequency of calms. The October and January maps have somewhat similar wind patterns as do the April and July maps. The most noticeable seasonal contrasts are to be observed between these spring-summer and autumn-winter periods. Thirdly, there is a well-developed regional pattern to wind characteristics. Finally, there appears to be a close

relationship between the regional wind patterns and the pattern of physiographic regions in New Zealand.

Study of the maps shows anomalies in the wind patterns which could well be the subject of future investigations. What, for example, are the causes of the seasonal contrasts noted at certain stations such as Wanganui? Why do other stations, Waihi and Wharekawa Nursery, have approximately the same windrose patterns in all four months? Why do several stations in localised areas have similar patterns that differ from windrose patterns in nearby areas? There is a curious anomaly of Nelson and Waihopai, only some forty miles apart but having dominant July winds from opposite directions. There may be some truth to the observation that stations close to highland regions have dominant July winds from the direction of higher elevations. Studies of surface wind patterns might lead to investigation of the relationship between upper winds and surface conditions.

GEOGRAPHIC NOTEBOOK

IN THIS ISSUE. Samoa is on the eve of important constitutional changes which will result in the establishment of cabinet government by 1960. Dr. R. F. Watters' article on the human geography of the islands at the time of the first European contacts, thus appears at an appropriate time. He suggests that the reasons why European influence on native society proved less disruptive than on many other Pacific island groups are to be sought in the nature of the village system of 'Old Samoa'. Dr. Watters is a graduate of the Victoria University of Wellington where he is at present a Lecturer in Geography. His archival research into the historical geography of Samoa was undertaken while a research student at the London School of Economics.

Mr. Roger Frazer holds a research scholarship in the School of Pacific Studies, Australian National University, Canberra. In 1957 he was Assistant Lecturer in Geography at the University of Auckland. His article sheds light on an important land problem which has hitherto had little objective analysis.

Mr. E. R. Bloomfield is a teacher at the Motueka High School. His article is based on his masters thesis presented at the Victoria University of Wellington.

Mr. G. J. R. Linge, Assistant Lecturer in Geography at the University of Canterbury, writes on a further aspect of his current research in the geography of New Zealand manufacturing. It is intended at some later date to report on the causes and effects of the development of manufacturing in Auckland since 1936, and to describe its contemporary pattern and problems.

Miss Eileen Elliott's study of the geomorphology of the Otago coast was prepared while she occupied a lectureship at the University of Otago. At present Miss Elliott is a planning officer with the Lanarkshire County Council, Scotland.

Dr. Charles B. McIntosh is Assistant Professor of Geography at Eastern Illinois University, Charleston, U.S.A. In 1953 he was Visiting Lecturer in Geography at Canterbury University College.

Shorter contributions to this issue have been made by Professor Keith Buchanan, Mr. S. H. Franklin and Mr. J. K. Cunningham of the Victoria University of Wellington; Professor G. Jobberns of the University of Canterbury; Dr. G. R. Lewthwaite, Mr. Bryan Farrell and Mr. Stewart Cameron of the University of Auckland; Dr. William H. Wallace of the University of New Hampshire, U.S.A.; Professor B. J. Garnier of University College, Ibadan, Nigeria; Mr L. S. Suggate of Christchurch; Mr. D. Hamilton of the University of Otago; and the Acting Editor.

PLANS FOR POWER. In March 1957, a plan for power production in New Zealand was submitted to cabinet and ultimately approved by the government. This is the *Report of the Combined Committee on the New Zealand Electric Power Supply*, which assesses the electricity requirements of New Zealand and makes recommendations for the decade ending 1970. The Committee is to be congratulated for at least

giving the public *some* concrete information on a subject vital to the country's welfare. Plans are based on five yearly estimates, figures for which are given by the electricity supply authorities, and longer term forecasts made by the State Hydro-electric Department.

At the time of writing the report, there were under construction in the North Island, 447,000 kW of electricity generating capacity, including 69,000 kW at Wairakei (geothermal steam) and 180,000 kW at Mercer (coal). When all these projects are completed, together with Roxburgh (hydro) in the South Island, the national capacity will be about 1.7 million kW. Notwithstanding this, it will be necessary to provide by 1970, 983,000 kW of extra capacity. Most of this will be used to supply North Island demand.

A major recommendation is that Benmore—a proposed station of 480,000 kW on the Waitaki river—should be developed as soon as possible and that the North and South Island transmission systems should be interconnected by a 600,000 kW undersea cable. This would allow the best use of storage and differential river flows in both islands and, most important, would provide the North Island with a useful source of power. Electricity from Benmore could not be delivered in Wellington before 1965 so it would be necessary to devise plans to overcome shortages in the North Island between 1962 and 1965. These are to be met in three ways: firstly by progressive extension of Wairakei to 82,400 kW in 1962 and by further expansion to perhaps 252,600 kW (no definite figure is given although a third stage is implied); secondly by the completion of the partly-finished hydropower projects on the Waikato and by the building of a 60,000 kW water power station at Aratiatia which will utilise the present scenic rapids as a spillway, and, finally (to meet peak loads to complement the base load stations of Mercer and Wairakei and to provide extra units when necessary) a gas turbine plant of 64,500 kW for Wellington.

After 1965, to supply the increasing needs of the North Island, further stations of about 200,000 kW each are suggested for the South Island's Waitaki River catchment, another step in the full development of the 1,500,000 kW potential. These stations will be Waitangi between Benmore and the present Waitaki station, and Maryburn between the interconnected lakes Tekapo and Pukaki.

Appendices to the report contain much that is both interesting and valuable. These include data on prospective loads, additional capacity required, details of proposed power stations, peak load compared with capacity, estimated expenditure to 1970, estimated transmission costs and snippets from relevant reports. Without doubt the report, thorough and comprehensive in many respects, is the outcome of much solid investigation. The recommended programme is specific and direct.

But as a public document the report has noticeable weaknesses. In Appendix G the Chief Engineer of the State Hydro-electric Department complains of uninformed public criticism of statements he had made about the North Island power supply in 1950. One can do no more than whole-heartedly agree, and lament the fact that seven years later the public still remains uninformed on many matters pertaining to New Zealand power production. The report gives much information on the one hand, but also leaves much unsaid or assumes too much on the other hand. On page 9, for instance, a high load factor is mentioned for Wairakei but the report does not

say specifically what it is. On the next page it is stated that Aratiatia is designed 'on the usual plant factor'—the implication being that the reader knows what this is. On the same page, in justification of interconnection, it is stated that 'treated as one system the problem of storage and the question of peak capacity would be much easier to deal with as the seasons are diverse in the two islands while the incidence of peak loads is also different.' Nowhere is there an elaboration of this statement and nowhere is there statistical evidence by which a reader may learn something about storage, river regimes and incidence of peak loads in the two islands. Appendix O gives summary information on power sites in North Canterbury and Marlborough but no attempt is made to give any detailed information on the character of rivers and catchments in this part of the South Island. More is the pity when government departments hold information on the physical character of New Zealand which is unavailable to the public.

Finally a list of seventeen references is given, more than half of which are not available to the public. It is not suggested that the report should be as full and as detailed as the monstrous congressional documents on, say, the Columbia or the Colorado rivers which, incidentally because they are published, must be of the greatest use to New Zealand power planners. One can only plead for a compromise between voluminous overseas publications and the slim report under discussion. If the New Zealand public is to be informed then more detail is necessary, the extra cost being a mere trifle when the national welfare, the goodwill of the people and hundreds of millions of pounds are involved.—BRYAN H. FARRELL

LAND UTILISATION IN NEW ZEALAND. The Land Utilisation Branch of the Department of Lands and Survey was set up in 1948. Unlike the much publicised Land Utilisation Survey of Britain, it was not inaugurated with the intention of carrying out a field-by-field survey of the purposes for which the land is used, but, in the words of the departmental report for 1950, 'the immediate objective is to ascertain systematically and comprehensively through the dominion the quantity of unimproved land suitable for development, the information so obtained being recorded for future use.' It reflected the idea that at a time when land development schemes (especially for the rehabilitation of ex-servicemen) were expanding so rapidly, a stocktaking of resources was needed to ensure orderly progress. It was hoped to prevent a repetition of earlier mistakes which had occurred when land had been used for less productive purposes.

Originally, the branch was envisaged as a clearing-house for information and advice, and as a co-ordinator of individual county surveys. It was soon obvious that if anything was to be achieved it would be by means of its own (almost) unaided efforts. With an expansion of staff, the branch began to carry out its own programme of field work.

Although changing methods and techniques have led to different results in terms of features studied and maps produced, the general approach to classification has changed little. Following a preliminary reconnaissance to locate generally the areas of promising undeveloped lands, maps showing vegetative cover and pastures are

produced by working from aerial photographs and checking by ground parties. After 'on-the-spot' surveys of soils, access, water supply, slopes and relief, they are classified as being suitable for immediate or deferred development for sheep, dairy or other types of farming. The final report is a comprehensive survey of suitable lands, as well as a general résumé of contemporary agriculture and land use.

Apart from a recent and most detailed survey of the counties of Buller, Inangahua, Grey and Westland (north of the Waiho River) almost all work has been in the South Auckland and North Auckland Land Districts. The first area covered included all land north of Auckland City followed by the counties of Raglan, Kawhia, southern Waipa, Otorohanga, Waitomo, Ohura and Taumaranui. Later, a more extensive survey was made of all counties north of Auckland. The Bay of Plenty-Taupo area has also received attention with the surveying of Taupo, Whakatane, Rotorua and Tauranga counties. Reconnaissance surveys have also been made of the Poverty Bay-East Coast area and the Thames, Piako and Matamata counties, although only in the latter group is it intended that work should proceed further.

It is obvious from this list that the areas covered are principally those in which there is substantial scope for agricultural expansion. In the main they are also areas where there are considerable problems of soils, drainage, access and water supply.

At present the reports are produced in small numbers, with hand-coloured maps, chiefly for the use of government departments. The main obstacle to publication appears to be the cost of printing the coloured maps. If they could be made available, the maps and reports would be of considerable interest to geographers. It is disappointing that so far, apart from the brief references in the annual reports of the Department of Lands and Survey, the only publication of the Land Utilisation Branch is the *Report on the Provisional Land Utilisation Survey of North Auckland*, Wellington, 1953, which is little more than a county by county check list of acreages of present and potential land use, accompanied by a map (at a scale of about 6 miles to one inch) showing 'farmable' and 'unfarmable' lands and the location of blocks suitable for development. Unfortunately, these blocks are not individually mentioned in the text. Neither the map nor the report appears to be representative of the work done in the area, and, in fact, it appears to have been published after only a preliminary survey.

Even the addition of the map showing pasture location and vegetative cover for which field work has now been completed would have greatly improved its worth.

Although the title 'Land Utilisation Branch' may not be wholly appropriate in view of the nature of its work, there is little doubt that it is performing a valuable service for New Zealand. If the information at present in the form of maps and reports could be published in a suitably abridged form it would almost certainly constitute an outstanding contribution to agricultural geography in New Zealand. In both secondary schools and colleges it could well form the basis of more comprehensive local and regional surveys.—ROGER M. FRAZER

THESES PRESENTED DURING 1957. Eleven theses in geography, prepared by candidates for the masters degree with honours in the University of New Zealand,

were accepted during 1957. These theses are now lodged in the libraries of the universities from which they were presented.

From the University of Auckland five theses were presented:

- Commercial Orchardring in New Zealand, G. J. Fielding;
- Palmerston North as an Urban Node, G. W. Hope;
- Land Use Problems in Raglan County, Margaret J. Melrose;
- Auckland—New Zealand's Premier Port, J. B. Rose;
- The Landforms of Auckland, D. M. Sinclair.

From the University of Canterbury five theses were presented:

- Commercial Orchardring in the South Island, C. L. Knight;
- A Geographic Analysis of the Waipoa Flood Control Scheme, F. W. Leadley;
- The Improvement of Light Land Under Irrigation on the Canterbury Plains, J. L. N. Moore;
- The Southern Hawkes Bay Coastal Fringe, K. N. Oldham;
- The Impact of Industry on Residential Christchurch, G. P. Shearman.

From the Victoria University of Wellington one thesis was presented:

- A Survey of the Industry of Clothing Manufacture in the City of Wellington, D. M. Archibald.

IN OUR CONTEMPORARIES

1. *In New Zealand Journals . . .*

A PLEA FOR LOCAL HISTORY

GRASS ROOTS AND DREDGE TAILINGS: REFLECTIONS ON LOCAL HISTORY: W. J. Gardner, *Landfall*, Vol. II, No. 3, September, 1957, pp. 221-233.

This article, advocating more intensive and scholarly work in local history, is relevant and challenging for geographers as well as historians. The author surveys the objectives and problems involved—vagueness of definition of the field, the myths and suspicions which impede investigation, and the conflicting demands of the local reader who wants annals, the general reader who wants a story, and the academic historian who requires illustration and background. The talented are tempted into other fields and local history, however unjustly, is largely relegated to mediocrity. Geographers will learn, with occasional sympathetic twinges of conscience—that ‘between popular demand and academic standards New Zealand local history appears suspended in unstable equilibrium’, that as Professor Morrell considers, too much historical research consists in ‘disinterring facts from documents and reintering them in theses’. Some comfort, however, may be derived from the opinion that history produced on time can scarcely be good history.

Yet local history meets a variety of needs. Apart from its function as a ‘bridge’ linking amateur and professional historians, its rapid sales give convincing evidence of vigorous demand in both country and city. Mr. Gardner considers if the general reader is not to be inoculated against better work that public taste must be educated and that the university must ask more of, and contribute more to, such history. The task is at once to stimulate the interest and meet the needs of the local reader, present the New Zealand pattern of origin, growth, and integration into broader provincial and national communities, and portray the ‘grass roots’ of people, movements and trends which often emerge on a wider stage. Such analysis evaporates myths and provides ‘a wonderful antidote to schematic history, particularly Marxist history and even the Whig history of Reeves’.

An evaluation of the Otago district histories leads to concrete suggestions for future guidance. Not only does this series provide much of real historical worth (particularly Dr. W. H. Scotter’s scholarly analysis of the pattern of development in North Otago) but it is the first such enterprise in Australia or New Zealand. Defects arise from haste to meet centennial deadlines, from omission of references, from failure to invigorate the records of controversy by apt quotation from primary sources, and from neglect of provincial and national files. But the Otago series has ‘touched off a process which will not exhaust public demand until district by district the New Zealand landscape is covered by local histories in provincial groupings’.

It is thought that the quality of such a series—difficult to revise until another centennial stimulates further effort—could be improved by the combined effort of

amateur and academic historians. A journal of regional and local history (perhaps sponsored by the National Historic Places Trust) and a conference organised with the co-operation of the Universities would encourage valuable amateur work. More direct university interest is also advocated: not so much the doubtful expedient of deflecting thesis research towards local history, but the encouragement of graduates, and (to foster continuous and autonomous academic study) the establishment of a Chair of New Zealand Social History.

Geography has much to gain from such initiative. Not only is the explanatory description of places chastened and supplemented by local history, but the encouragement of such history should surely be matched by intensified studies in local geography. True enough that the broad regional framework of New Zealand has been perceptively outlined, but solid local research remains essential to the refinement and interpretation of New Zealand geography. There is much in the opinion which Professor S. W. Wooldridge reiterates in *The Geographer as Scientist* that to make geography real we must make it *local*, and that Chesterton's 'thousand little lands within one little land that lie' form our laboratories. Even the shotgun marriage of history and geography as Social Studies in the secondary schools has not proved entirely barren, for local investigation has been promoted, and, were the scattered results to be collated, would doubtless yield information that individual field workers could not uncover for many a year. Such work, however, has been at a junior level and geographers wish historians well in their efforts to improve and promote the writing and publication of local history.—G. R. LEWTHWAITE

2. *In Overseas Journals . . .*

COMMERCIAL OPPORTUNITY IN NEW ZEALAND TOWNS

THE RETAIL POTENTIAL OF SOME REPRESENTATIVE NEW ZEALAND TOWNS: L. L. Pownall, *Economic Geography*, Vol. 33. No. 2, April 1957, pp. 163-170.

Dr. Pownall's article is concerned with the ratio of commercial workers in a town to the total population of that town's tributary region. In Invercargill, for instance, for every 21.7 persons in its tributary region there is one commercial worker (a person employed in distribution and financial services). However the ratio is not the same for all towns of approximately the same size as Invercargill; New Plymouth, for example, has one commercial worker for every 29.3 persons in its tributary area. Similarly towns in other size groups show different ratios. Hokitika, in the 3,000-4,000 group, has a ratio of 1: 36.8 while Whakatane's ratio is 1: 63.5. Now for New Plymouth to obtain the same ratio as Invercargill would mean an increase of 932 commercial workers in New Plymouth, or a 35 percent increase in the existing commercial labour force. Thus it may be said that New Plymouth has a potential capacity for expansion of commercial services of 35 percent or, an Index of Potential Distribution and Finance, (I.P.D.F.) of 35. These I.P.D.F.'s are shown on a map as Numbers of Units of Potential, the circles being proportionate to the size of the I.P.D.F., a percentage thus becoming a unit.

It appears from Dr. Pownall's map that the retail potential is most marked in the South Auckland area, and in northeastern Northland. Of the towns surveyed the following have, in descending order, the highest retail potential, measured in units of potential—Kaikohe, Putaruru, Alexandra, Ohakune, Balclutha, Rotorua, Waitara, Whakatane. The map also indicates that Reefton and Picton, Huntly and Westport have greater potentials than Hamilton, Palmerston North, New Plymouth or Hastings—which may come as a surprise to both business men and geographers. The article includes a very interesting map, depicting, for the first time, the hinterlands of numerous boroughs and cities.

The author points out in a footnote that the method used is in no sense definitive and final, and this reviewer considers three major objections can be raised against it.

First, the whole concept of retail potential is based upon the fact that the I.P.D.F. indicates the percentage increase in commercial employment that might occur in town B or C, if they had the same ratio of commercial workers to total population as town A—which in every size group is the town that happens to have the lowest ratio. Thus the I.P.D.F. for New Plymouth is calculated from the Invercargill ratio which is the lowest for the 19,000-34,000 size group. Nowhere are any arguments brought forward to justify the adoption of the lowest ratio of the size group as the basis for all calculations. Presumably, one can argue that the low ratio represents the 'saturation' of the total demand of the region, i.e. there is no justification on the basis of economic turnover per employee for the employment of more commercial workers. But equally one may argue that the ratios reveal Invercargill shops to be on the whole less efficient of labour than the shops of Hamilton or New Plymouth. There is no way of choosing between these two types of argument except to establish the economic significance of these ratios and thus establish whether the computations are valid or not.

One can believe that in Putaruru there is room for more shops and retail workers because its development is so recent and that in time the ratio may fall from 1: 90 to a lower figure. But it is hard to believe that commercial opportunity is going begging in places like Reefton, Ohakune, or Huntly. And, while relatively the potential may be greater in Putaruru than Hamilton, the real potential in Hamilton is of course much larger than in Putaruru.

Second, the concept of retail potential as presented in this article is a confusing one, for it is a question of relative potential. This is illustrated in the case of Waitara and New Plymouth, the former with 81 units of potential, the latter with 35 units. Waitara's potential is obtained by matching its 'commercial workers to total population' ratio with the lowest ratio for Waitara's size group 2,000-3,000. Thus relative to Morrinsville, Waipukurau and Motueka, Waitara has a high retail potential. But surely Waitara's retail potential must be considered in relation to New Plymouth, not to Morrinsville. This, one presumes, is what any business man does in deciding whether to locate in New Plymouth or Waitara.

Thirdly, the conversion to units of the percentage increases in employment (I.P.D.F.'s) of individual towns is rather strange, but to plot them all on the same scale of values, which is done on Dr. Pownall's map, is inadmissible, simply because the I.P.D.F.'s for different size groups are not comparable, because they are computed

from different bases, and in all probability the figures used cover different sorts of economic structures.

These 'Units of Potential Increase' are no more than the percentage increase for individual towns, arrived at by computing what the increase in numbers would be for a town if it had the lowest ratio for its size group.

Nothing more clearly establishes the inadequacy of the method and the inadmissibility of plotting different values on the same scale than the following illustration which corresponds rather closely to the case of Kaikohe. Let us suppose that Kaikohe has a population of 1,999 and the population of its tributary area is 10,000. With a ratio of 1: 100 its commercial labour force is 100 persons. Now relative to Kaikoura, the town with the lowest ratio, 1: 25, for the size group 1,000-2,000, Kaikohe would have to increase its labour force by 300, to obtain such a ratio as that of Kaikoura. Thus its I.P.D.F. is 300, and its units of potential increase are 300. However, with a tributary population still of 10,000, a ratio of 1: 100 but with a town population of 2001, Kaikohe now enters the size group 2,000-3,000, and Dargaville with a ratio of 1: 40 is now the basis for computing Kaikohe's retail potential. For Kaikohe to obtain such a ratio as that of Dargaville its commercial labour force must increase by 150 persons, i.e. 150 units of potential increase. Two more babies and the potential is cut by half!

Dr. Pownall has tackled a complex and important aspect of urban geography but his method would appear to require considerable refinement. Alternatively the subject might be approached from the angle of the economic structure of the different branches of distribution and finance.—S. H. FRANKLIN

ANTIPODEAN TRANSPORT—A GERMAN VIEW

VERKEHRGEOGRAPHISCHE ÜBERSICHT VON AUSTRALIEN, (Survey of Australian Transport Geography): Gunther Kohler, *Petermanns Geographische Mitteilungen*, 100 Jahrgang 1956, 3 Quartalsheft, pp. 209-212.

Professor Köhler has attempted a 'survey' of transport, not only in Australia but also in New Zealand, and in New Guinea. His survey is really all-inclusive for, in addition to considering the major media of land, sea, and air transport, there is a section on transport by pack-animals including, in 1941, 2,267 camels and 10,888 mules and donkeys. This unusual form of goods carriage is significant primarily in remote portions of Western Australia and the Northern Territory, and we are informed that here, as elsewhere, dromedaries and Mohammedans (in this case Afghans) are found in association. Another unusual aspect of transportation that is considered is the character of bridges in various parts of Australia. Here, however, the citizens of Sydney may be somewhat chagrined to find that mention of the famous Sydney Harbour Bridge is conspicuously absent.

The paper is primarily concerned with transport routes and facilities, and the text is accompanied by three maps—a map of transport routes and facilities in Australia, a similar map of New Zealand and, thirdly, an airline route-map of Australia, New Zealand, and neighbouring islands. These maps are perhaps the most useful part of the paper, although the choice of symbols used to represent the two principal railway

gauges used in Australia is unfortunate. It is almost impossible to distinguish between the two shades of red that are used.

The discussion of Australian sea transport leaves one with the impression that the ports on the eastern coast are primarily concerned with trade across the Pacific, while Adelaide, Fremantle, and Darwin have their principal trade connections with South Africa and Monsoon Asia! Surely the vast Australian trade with the United Kingdom and Europe is a major factor at all important overseas ports, regardless of what coast they happen to occupy. When New Zealand's ocean-trade is considered, we are told that 'the trans-oceanic shipping lines go, in general, to the *more favourably situated* North Island, while the South Island has *only* busy coastal shipping, particularly on the eastern side.' (Reviewer's italics). New Zealand geographers will be surprised to learn that the population and production of the North Island are not factors to be considered in understanding the traffic of its ports, and that the South Island lacks overseas shipping connections. Again, no mention is made of the overwhelming importance to New Zealand of trade with the United Kingdom.

The unique inter-island rail-air ferry service of the New Zealand Railways also comes up for discussion but misconceptions mar the presentation. The rail-air ferry service is described as operating not only between Paraparamu and Blenheim, as is the case, but also to Nelson, where there is no longer a railway! A more serious error, however, is the statement: 'Here whole railway goods wagons are flown over Cook Strait.' Another mistake is that in the interpretation and cartographic representation of the South Island rail pattern, the light-traffic Christchurch-Picton Line (which is really not part of a main line, but is operated quite separately from the Main South Line) is classified as a major line, while the much more heavily-trafficked Midland Line, linking Canterbury with Westland, is relegated to the 'secondary line' category.

Turning finally to air transport, another problem arises. In both text and map, the primary classification of airlines is into two groups—'international' or 'national'; these terms are nowhere precisely defined, and the reader can only assume that the distinguishing characteristic is whether the route crosses an international boundary or not. If this assumption is made, it is very difficult to accept such routes as Sydney-Auckland, Christchurch-Sydney, Christchurch-Melbourne, Sydney-Noumea (New Caledonia), and Hollandia (Australian New Guinea)-Biak (Dutch New Guinea) as *national* airlines.

At several places in the article, Prof. Köhler links the pattern of transport routes with physical phenomena in what appears to be a causal relationship. Surely an interpretation of the pattern of transport routes should begin with a consideration of traffic-producing phenomena such as population and economic activity.

This reviewer concludes that this paper will tell New Zealand geographers nothing that they cannot readily (and more accurately) learn by consulting the *Yearbooks* and maps that have been used in preparing this 'Survey of Australian Transport Geography'. The major criticism that should be made of this paper is its superficiality, but the misconceptions that it conveys are also damaging. The field of transport geography badly needs cultivation, but this type of work serves only to confuse and to discredit the discipline.—WILLIAM H. WALLACE

REVIEWS

THE EARTH AND HUMAN ACTION

MAN'S ROLE IN CHANGING THE FACE OF THE EARTH. Edited by William L. Thomas, Jr. Published for the Wenner-Gren Foundation for Anthropological Research and the Natural Science Foundation, University of Chicago Press, Chicago, 1946, pp. 1193, \$12.50.

In a necessarily brief review of this massive volume all that can be done is to call attention to the general nature of its contents and its theme. In it are the fifty-three papers presented at a symposium organised and financed by the Wenner-Gren Foundation for Anthropological Research and held at Princeton, New Jersey in June 1955. The papers were circulated to the seventy participants prior to their meeting to give them the general background material and allow them the greatest possible freedom in discussion. In the latter eighty pages or so of the volume the substance of the discussion is presented in summary form. The purpose of this interdisciplinary symposium was to bring together some of the world's best minds to have a look at what man has done and is doing to his earth (and himself) in the process of his living on it. The organisation of such a meeting was in itself a notable achievement; we see something of its complexity from the introductory note written by William L. Thomas, Jr., then secretary of the sponsoring foundation.

The symposium was organised into three major sections, the first looking in retrospect on the making of the contemporary scene, the second examining some of the major processes by which man continues the modification of his habitat, and the third essaying an estimate of what is in store for us and our earth in the ages ahead.

Three co-chairmen responsible for guidance of the discussion and offering summary statements were Professors Carl Sauer (Geography, University of California), Marston Bates (Zoology, University of Michigan) and Lewis Mumford (City and Land Planning, University of Pennsylvania). The contributors, too, are all experts in their several fields of enquiry and with all their diversity of special interest and outlook they find a common interest in their concern for what man is doing to and for his earth. All would be ready to share in the dedication of their book to the memory of George Perkins Marsh from whose famous work, *Man and Nature; or Physical Geography as Modified by Human Action* so many of them have directly taken inspiration.

This is a monumental collection of essays by a group of very distinguished scholars, all interested from some angle or other in the theme of man and his land. A random list of titles must serve to indicate something of the wealth of material and diversity of subject matter contained in this volume. Among the 52 papers one might list 'The Agency of Man on the Earth,' by Carl Sauer; 'Fire as the First Great Force Employed by Man,' by O. C. Stewart; 'The Clearing of the Woodland in Europe' by H. C. Darby; 'The Quality of Land Use of Tropical Cultivators' by Pierre Gourou; 'The Nature of Induced Erosion and Aggradation', by Arthur N. Strahler; 'The Time Scale in Human Affairs' by Sir Charles Darwin; 'Man as a Maker of New Plants

and New Plant Communities' by Edgar Anderson, and F. Frazer Darling's 'Man's Ecological Dominance through Domesticated Animals on Wild Lands'. As a store-house of ideas it is indispensable to any serious student of geography and a reminder that study of the face of the earth is not his field alone. It is not a book that would be read straight through from cover to cover, but as a reference and a stimulus it should have a place in every geographical library.—G. JOBBERNS.

A NEW VIEW OF EUROPE

EUROPE AND ITS BORDERLANDS. By Alan G. Ogilvie. Edinburgh: Thomas Nelson and Sons, 1957, pp. 340, 42s.

This major work was almost completed by the late Professor Ogilvie before his untimely death in 1954. Dr. C. J. Robertson, his colleague at the University of Edinburgh and his literary executor, has filled in some small gaps and prepared it for publication. This may well have been a labour of love, and an important book has been added to geographical literature concerned with Europe. This volume has unfortunately very few references (Dr. Robertson explains that all he has found have been printed) but one does not need to get very far into the book to realise that it is a work of profound scholarship and mature judgment.

Europe and its Borderlands is far from being a conventional geography text. It is concerned with the traditional Europe stretching eastwards to the Ural Mountains, together with what are described as 'the Borderlands', North Africa, Caucasia and the nearer parts of the 'lands of the Five Seas'. This area includes about one-twentieth of the world's land surface but more than one fifth of its population. In setting out to survey, within a relatively modest compass, this somewhat arbitrarily delimited area 'as the theatre of Western civilisation', Professor Ogilvie undertook a difficult task. His emphasis is upon the past in relation to the present, upon the complex physical setting and the varying hum in response culminating in the existing character and landscape of the different regions. The task called not merely for a deep knowledge of the area in both its physical and human aspects but for a concentration on essentials, a balanced judgment and a considerable economy in presentation. It has been admirably carried out. Professor Ogilvie wears his scholarship easily and while his presentation is closely knit it is clear and not without its picturesque touches. The device of including the Borderlands in the survey has been skilfully used to enlarge the background of the main picture of the development of Europe.

The first nine chapters are chiefly concerned with physical aspects, and although the treatment is necessarily generalised, they have a refreshing and stimulating character. Thus the chapter on climate, after several pages concerned with the essentials of the dynamic meteorology of the area, goes on to initiate a division into climatic regions by describing the distribution of selected indigenous trees and groups of trees on the ground that 'vegetation . . . is the mirror of climatic complexities'; the distribution of 'traditional' crops is used in the same way. This is an interesting advance into a field into which the author recognises that much research is needed. The next ten chapters deal with the human geography. The cultural influences and the major results of 'the human impact'—especially the growth of cities—are described and a short chapter on frontiers (which seems uncompleted) is followed by

others on the economic geography. The treatment is far from formal; there is much discussion of the varying cultural landscape, the historical influences, and the effects of industrialisation and of modern means of transport. Statistics are few but the attitude of the observant and correlating geographer is always apparent. The chapter on population is again set against a historical background. The remaining chapters discuss the author's division of his area into eight major regions which involve a number of areas of a transitional or overlapping character. He makes good use of what he calls 'the cores or nuclear areas of the nations,' the map of which is one of the most interesting and suggestive in the book, and considers the importance of national frontiers in connection with the divisions, giving weight—perhaps not enough—to the spread of 'sovietisation' in eastern and central Europe.

The maps are in general an unusually significant part of the text, although some admittedly lack precision because a firm factual basis is not available. In most cases the reader will ponder them because of the trains of thought they suggest. Only a few appear to be borrowed from other authorities; one of these, Fig. 11, has a misleading caption the explanation of which is found eight pages further on and then proves somewhat inadequate.

It is sad to think that Professor Ogilvie did not live to see the publication of this work which, says Dr. Robertson, 'lay close to his heart'. *Europe and its Borderlands* enriches geographical literature with a masterly volume to which students will long turn as an outstanding example of the scope and methods of regional geography and as a stimulus to further study.—L. S. SUGGATE

A STUDY IN TROPICAL GEOGRAPHY

THE TIMOR PROBLEM: A GEOGRAPHICAL INTERPRETATION OF AN UNDERDEVELOPED ISLAND. By F. J. Ormeling. The Hague: Martinus Mijhoff, (second impression) 1957, pp. 284.

The last decade has brought a growing volume of studies of the geography of the tropical world. Such studies are providing us with a more sharply-focussed picture of man-in-nature in a formerly little-known section of the globe. More than that, they make it increasingly clear that the relationship between man and his environment, the use he makes of that environment, and the fashions in which he transforms it, can be understood only if we have an awareness of the very different social, cultural and technological bases on which tropical societies (as opposed to western society) rest. So important is this awareness to an understanding of the tropical world that we might often profit by inverting the traditional geographical approach and begin with a study of man, his culture and problems of adaptation and proceed *then* to an evaluation of the environment *in terms of the culture of the occupying group*. Population patterns, for example, are often explicable only in terms of magico-religious influences; the character and distribution of vegetation and disease are influenced by population pressure; patterns of resource utilisation are influenced by social structure, by taboos, or by political organisation. Ormeling's study of Timor does not depart drastically from the traditional pattern of regional studies, but it does show a refreshing awareness of the points made above.

It is essentially an ecological study—a study of the island environment, of its peoples and their delicately adjusted traditional life; a study, too, of the dislocation of this balance by outside influences—new peoples, new crops, new animals and new weeds.

The island's environment presents problems to any group, a capricious relief diffuses natural resources, arable land, and water; geological and soil conditions present problems to the shifting cultivator or the Western agriculturalist with his schemes of mechanised agriculture; climate is harsh, with a long dry season and variable rainfall; the vegetation has been destroyed or transformed by man. It is a marginal environment. It is also, from the human point of view, a transitional area, lying between the Malayan and Melanesian worlds, disputed between pastoralist and cultivator, occupied by primitive and more advanced groups, overlain by Western colonisation, and penetrated by settlers from China and the nearby island of Roti. Any analysis of Timor's geography must take into account this cultural diversity: as Ormeling observes (p. 236) 'the more Indonesian-Malay affected groups utilise their environment more fully . . . than the Timorese proper'.

The traditional life was based on shifting cultivation, supplemented by food-gathering. Stock were economically unimportant but had considerable social significance. Inadequate techniques imposed on man a low and static level of existence. Improvements were impeded by social obstacles such as the weak land attachment of the peasant; the *suku*, or kin group, which stood in the way of individual advancement and the feudal dues which formed a burden on the productive capacity of Timor society. Taboos narrowed the diet of the people, prevented effective utilisation of resources and may actually account for the emptiness of areas such as the Rena Plain.

Contact with the West brought many changes. The sandalwood trade depleted the forests, bringing profits to a few. In its wake came liquor, firearms, dice-playing, cockfighting and a wide range of new crops. Maize and millet replaced the traditional root crops; cassava became increasingly popular, a retrograde step in view of its low food value. Buffalos came late into the Timor economy and are used in treading the rice fields; horses, introduced by the Portuguese, increased mobility and contact; government-introduced cattle herds reduced the land available to the cultivator, imposed on him the burden of fencing (now one-quarter to one-third of the labour input in agriculture) and, concentrated largely in the hands of the rulers and Chinese, they contributed little to improve the living levels of the masses. As in other parts of the world, the impact of the West was followed by an explosive increase in population; numbers trebled in a century, pressure on resources built up and deforestation, soil erosion, falling water tables and increasing hunger emphasised clearly the destruction of the old equilibrium between man and land. Today some 442,000 people are struggling to wrest a livelihood from an area where 280,000 might hope to live in some comfort.

Other groups introduced new complexities and tensions into Timor society; the 6,000 Chinese concentrated in the towns and monopolised trade, especially the cattle trade, and migrants from the adjoining island of Roti who, with better health and living levels and a greater political sophistication, have tended to exercise an influence out of all proportion to their numbers. The position of these groups will become increasingly precarious as the Timorese advance.

The latest immigrant is a weed, *lantana*, a thorny shrub introduced some 40 years ago, which today occupies between twenty-five and fifty percent of the island. The weed has been aided in its spread by man and forms chaotic wildernesses almost impenetrable to man or beast. The pastoralist hates it since it ruins his grazing lands, the cultivator, by contrast, is inclined to welcome it since it is reputed to restore fertility and make for easier cultivation.

The future is gloomy: 'the physical environment is gradually becoming worse as a result of man's reckless mismanagement . . . Monsoon forests give way to savanas, savanas to steppes, and steppes gradually degenerate into desert-like stretches. Wind and water erosion ruin the soil. The climate appears more extreme . . .' (p. 217). Man flees from the scene of his destruction, but migration brings only temporary relief. The more land is lost to erosion, the greater the pressure of man and beast on the remaining areas. 'Thus the anthropogenic destruction spiral . . . reveals itself on Timor, leading to deterioration of both nature and culture' (p. 218).

'An island is a world', and within the compass of this tiny tropical island the author has been able to illustrate many of the problems of man and resources discussed on a global scale in the recent symposium, 'Man's Role in Changing the Face of the Earth' (ed. W. L. Thomas, Chicago, 1956). That Dr. Ormeling's monograph should immediately call to mind this massive and stimulating symposium is perhaps the most striking comment on the depth and quality of his work.—KEITH BUCHANAN.

POLITICAL GEOGRAPHY

THE CHANGING WORLD: STUDIES IN POLITICAL GEOGRAPHY.

Edited by W. Gordon East and A. E. Moodie. London: George G. Harrap and Co. Ltd., 1956, pp. 1040, 42s.

This book is a balanced survey of the political, social and economic changes that are taking place in various countries and regions of the world today, and analyses the geographical and historical conditions which lie behind them. It is a mammoth work of over one thousand pages and much of the book's success must be attributed to its careful publishing and editing. The printing is fine and clear; the maps numerous and helpful; the bibliographies at the end of each chapter are extensive; and the copious footnotes are useful rather than pedantic.

It is informative to compare this work with Dr. Isaiah Bowman's *The New World*, published in 1921-2, which pioneered the geographical analysis of international problems on a world scale. Owing to the many political changes since then, it has become an historical text, a picture of a bygone age, but none the less interesting because of that. The proportion of *The Changing World* devoted to Europe is 20 percent compared with the 60 percent devoted to Europe by Bowman in 1921. It helps illustrate the Toynbee thesis that the history of the contemporary world is being increasingly written in terms of the world's impact on the West. The trend of ten centuries for history to be written in terms of the West's impact on the world is perhaps completely reversed. That is unless the technological lead of the West—communist and non-communist—helps bring in new solar worlds to balance the old.

As is to be expected when the work of twenty English-speaking geographers is

combined into one book, the standard varies from one chapter to the next, but on the whole it remains high. In the chapter on New Zealand, Miss Eila M. J. Campbell is to be congratulated for presenting so many facts in such a short space and yet making them of interest. The misleading generalisations, which so often mar thumbnail sketches, are absent. Yet one must ask whether political geography should comprise a mere synthesis of constitutional, political, sociological and economic material. The reviewer would be the last to deny that such matter is the essential raw material for political geography, but for the subject to achieve any recognition in its own right, it must weld the separate ingredients together with an obviously regional approach. Generally speaking, Miss Campbell has failed to do this, and in this respect her chapter compares unfavourably with that written on Australia by Professor Spate, or that written on South Africa by New Zealand's own Professor Keith Buchanan. Yet Miss Campbell's synthesis is infinitely preferable to the older type of political geography, not represented in this book, which gave constitutional, political, sociological and economic material a false unity by attributing a close connection between it and the physical environment.

Readers will be pleased to note that Miss Campbell has frequently acknowledged her indebtedness to articles appearing in the *New Zealand Geographer*. But these articles are not written upon aspects of our political geography. Indeed this field is a notable deficiency in our geographical research that should be remedied as soon as possible.—J. K. CUNNINGHAM

A GEOGRAPHY OF NIGERIA

LAND AND PEOPLE IN NIGERIA: THE HUMAN GEOGRAPHY OF NIGERIA AND ITS ENVIRONMENTAL BACKGROUND. By K. M. Buchanan and J. C. Pugh. London: University of London Press, 1955, pp. 252, 35s.

According to the authors' introduction *Land and People in Nigeria* was conceived 'in the form of an atlas with a short text commentary'. The work was subsequently recast 'on the basis of a greatly expanded text' because of the absence of background material about Nigeria. The result is a volume which the authors hope will serve 'as a [geography] text-book at University level [and] as a source of background material for those concerned, directly or indirectly, with development projects'.

Many readers of the book will wish that the form as originally planned had been maintained, for the text is undoubtedly the weakest part of the volume. The presentation is formal and the writing dull. Moreover, geographers will be distressed to find here a concept of their subject which appears to make it one which lists a country's contents from A to Z (in the present case from geology to the Nigerian currency system), and throws in 'explanations' of landforms, climate, and the distribution of human activities. Some terms are misused: 'landscape', for example, is used in a restrictive, physical way and 'topography' is confused with physiography or relief so that the 'topographical units' of chapter one are physical divisions and nothing else. The reader is nowhere given a picture of Nigeria as a distinctive geographic unit, nor is he able to gain any appreciation of the contrasting character of its geographic landscapes.

But if this reviewer finds it difficult to recommend the volume as an example of geographic writing, he is not under the same restraint as regards the maps and diagrams. There are 172 of them. Together they constitute a useful collection of information about Nigeria. Their scope is comprehensive, ranging from a map of the country's geology to one showing the number of beds in different hospitals. A large number of maps are original, both in the material they portray and the way they do it. Relief, drainage, climate, disease, forests, population, tribes, settlements and their functions, agriculture in all its aspects, minerals, trade, transport, water supply, post offices and education are all placed upon the cartographic stage where they display their varied distributions and character in an entertaining and, at times, attractive way. Some of what they show is already unfortunately out of date, for Nigeria is changing rapidly. It is a pity, therefore, that many of the maps and diagrams do not carry in their captions the date and source of the material upon which they are based. This would help the reader to put them into their present-day context and, incidentally, relieve him from a tantalising curiosity as to how, for instance, in a country like Nigeria, the authors obtained data for plotting the average daily traffic flow in 1950 (figure 155).

In addition to the maps and diagrams, the book contains sixteen full-page plates and a number of pen sketches. The former are nearly all air photographs. It is a pity that they have not been supported by a careful selection of ground photographs and close-ups. These could also have usefully replaced most of the pen-sketches, especially those depicting Nigerians and their houses and crafts which hardly do justice to the quality of the local scene.

Land and People of Nigeria is perhaps best regarded as a useful source of factual information about the country—a kind of gazetteer—round about 1950. Recent developments have inevitably made some of it out of date. This cannot be helped and need not detract seriously from the greater part of the information presented. It is unfortunate that there is so much text. Statistical tables, notes, and an annotated bibliography would have provided a sounder support for the maps which portray so many of the facts upon which a geographical interpretation of Nigeria must rest.—B. J. GARNIER.

A WORLD FOREST INVENTORY

A WORLD GEOGRAPHY OF FOREST RESOURCES. Edited by S. Haden-Guest, J. K. Wright and E. M. Teclaff. *American Geographical Society Special Publication*, No. 33. New York: Ronald Press Co. 1956, pp. 736, \$12.50.

This ambitiously-conceived volume was eagerly awaited during the several years of its preparation, but those who expected it to be an up-to-date equivalent of Zon and Sparhawk's *Forest Resources of the World*, published in 1923, must be disappointed. A well-integrated and very readable introduction of five chapters on the history and significance of forests to man is followed by some twenty-five regional statements. These are written, not only in terms of widely divergent viewpoints and concepts, but with degrees of authority varying from the unimpeachable to the somewhat doubtful. These surveys give no basis for quantitative comparison of forest

resources as they are so highly variable in content, scope and presentation. A brief summary of the treatment accorded four areas, chosen at random, may help illustrate this point. Richard St. Barbe Baker's account of the forests of the British Isles is stronger on footnotes to history and 'Men of the Trees' platitudes than on relevant and easily-extracted statistics. For South Africa we have a botanist's-eye-view of the forests with a minimum of quantitative statements. An adequate résumé of the Philippines' forest composition and distribution is matched by mere hints of their economic significance. On the other hand S. A. Vahia gives a well-balanced, integrated account of Pakistan's forest resources.

New Zealand's contribution is at least authoritative but reference to *The National Forest Survey of New Zealand, 1955, Vol. 1*, shows readily the degree to which much valuable and pertinent material has not been included.

Erhard Rostlund contributes a thought-provoking final chapter on the outlook for forests and forest produce.

In the thirty-three years since *Forest Resources of the World* had appeared the basic information for the compilation of accurate forest maps had become abundant, but the small text-maps in the book under review do not reflect this trend. Surely a work of this magnitude, a major *Special Publication* of the American Geographical Society, warranted larger-scale, more detailed maps even if rising costs precluded the use of the colour.

The fifty-four page block of illustrations near the end of the book is adequate whilst a special bibliographical note by Eileen Teclaff is a very practical appendix. Elsewhere in the book, however, the method of documentation is as unreliable as are some of the sources quoted.

For all its shortcomings as a comprehensive reference, *A World Geography of Forest Resources* does bring together much otherwise inaccessible material and many conflicting opinions and one must concede that the text, considered as a whole, does possess that 'immediacy, vividness and authenticity' claimed for it in the Preface.

—STEWART CAMERON

AN INVENTORY OF NEW ZEALAND FORESTS

THE NATIONAL FOREST SURVEY OF NEW ZEALAND, 1955. VOLUME I, THE INDIGENOUS FOREST RESOURCES OF NEW ZEALAND.

By S. E. Masters, J. T. Holloway and P. T. McKelvey. Wellington: Government Printer, 1957, pp. 107, 17s. 6d.

The stocktaking of native timber reserves which has been carried out since the war by the National Forest Survey of New Zealand is one of the most important contributions yet made to knowledge of our natural resources. It is fitting, therefore, that the summary results of the survey should have been presented in a volume worthy of the effort and expense put into the ten-year task. Admittedly, the binding is austere, but the quality of the text, maps and photographs makes this book inexpensive at seventeen and sixpence. As a contribution to an informed public opinion on forestry matters it deserves wide circulation.

The book is in three parts. Part One contains a brief history of man's role in

forest destruction in New Zealand, reviews the need for a comprehensive survey to replace the reconnaissance inventory of 1923 and summarises the methods by which it was carried out. Part Two occupies the greater part of the book and deals, on a regional basis, with the forest types and quantities of merchantable timber. The final section considers 'problematical' reserves, discusses increment rates in virgin stands and gives an assessment of the prospects for regeneration of indigenous forests.

The survey could not have been carried out but for the availability of air photos. Forest-type maps on a large scale were prepared by photogrammetry, and field parties, working at times in very difficult conditions, carried out systematic ground sampling to record forest composition and to measure timber quantities. In forests of heavy timber density one-acre plots were measured at quarter-mile intervals on lines spaced one mile apart.

The book is abundantly illustrated with maps and the eighteen photographs include some outstanding forest interior views by J. H. Johns. The small-scale frontispiece maps show accurately, for the first time, the present distribution of indigenous forest in each island. Two maps showing the approximate extent of forest in 1840 are the most accurate yet published, but unfortunately they are printed on a slightly different scale from 1955 maps. Eleven regional maps show in detail the distribution of merchantable and non-merchantable forest, while cartograms show the proportion of forest land under different tenures in each survey region. It is most disappointing, however, to find that these admirable maps have been reproduced at no less than five different scales. Thus a false impression of the comparative areas of merchantable forest may be given when any two maps are compared, most seriously perhaps when the maps of the central North Island and north Westland are seen together. Three statistical maps, showing by proportional circles the quantities of available timbers of different species, give a ready visual impression of the regional distribution of the indigenous timber resources.

It is refreshing to read an official survey which has broken free of the fetters of existing administrative divisions such as provincial districts. The National Forest Survey for its own purposes has defined more realistic geographic divisions based on the characteristics of the forests themselves. From the textual description of the forest types, the distribution maps and the tables of timber reserves, the reader can obtain a much clearer picture of the regional geography of New Zealand's indigenous forests and their economic potential than was hitherto possible.

Some important conclusions can be drawn from the various statistical tables. Today New Zealand has 14.5 million acres of indigenous forest covering 22 percent of the country. Only two million acres contain accessible merchantable timber, this area being divided almost equally between North and South Islands. The total available softwood resource is just under 16,000 million board feet. Of this, 58 percent is in the South Island and only 42 percent in the North. (At the present annual cutting rate of 275 million feet this resource would be exhausted in sixty years. If the North Island alone is considered, native softwoods would last only another thirty-five years.) Timber classed as 'problematical' (on account of difficult access, low quality or conflicting land uses) might increase the softwood reserve by 17 percent. Millable

hardwood timbers—mainly beech and tawa—have been assessed at just under 6,000 million board feet of which 54 percent is in the South Island. Since annual consumption is only about 40 million feet these hardwood reserves can be expected to play a greater role in the timber economy of the future.

Two very striking distributional features have been revealed by the survey: firstly the outstanding proportion of the total native timber resource which is located on the West Coast of the South Island (49 percent of the softwoods and more than the North Island total); secondly, the appallingly meagre reserves in the southern half of the North Island. South of a line joining Napier, Ohakune and the Mokau River, in an area that once contained some of the country's finest timber stands, there remain only four percent of the total softwood reserves. This fact should underline the need for the urgent establishment of several exotic forests in the southern North Island, even if some farmland of moderate quality has to be converted to timber production.

New Zealand is the first Commonwealth country to have completed a forest survey using modern air photography techniques. Indeed, few countries in the world, apart from Sweden and Finland with their much simpler patterns of forest types, have made such a full inventory of forest reserves. The information which has been collected will be of great ecological and economic importance and will no doubt serve as the basis of national forest policies for many years to come. As stated in the preface to the volume, 'The completion of a National Forest Survey of New Zealand marks one of the turning points in the Dominion's history of land use'.

—MURRAY MCCASKILL

SOIL CONSERVATION SURVEY

SHOTOVER RIVER SURVEY (UPPER CATCHMENT): *Otago Catchment*

Board Bulletin, No. 1. Otago Catchment Board, Dunedin, 1956, pp. 72.

Since the passing of the Soil Conservation and Rivers Control Act in 1941, a considerable amount of research work has been done by officers of Soil Conservation Service and the Catchment Boards. The results of this work only rarely become accessible so that the appearance of this bulletin is greatly to be commended.

The bulletin is the first of a series of surveys of the upper tributaries of the greater Clutha catchment. It is not purely a river survey as the title might suggest, but is an attempt, and a successful one, to examine those factors that have a bearing on the reduction and prevention of erosion in the high country. There is a dual importance in this work. Firstly, concern for the continued wellbeing of the high country itself and secondly, the hydrological aspect of the flooding pattern and the supply of waste from the catchment as they affect the regimen of the main Clutha River.

With but a few notable exceptions, previous investigations of the South Island high country have been either regional in character or of a specific aspect. Soil conservation, however, is concerned with the complex interaction of both natural and induced factors within the natural unit of the catchment.

Widely known as the scene of past alluvial and reef gold mining, activity in the Shotover valley today is almost solely pastoral and this is confined to the more

favourable areas of tussock grassland. The upper catchment, with an area of 276 square miles, is held in extensive holdings, but due to the rugged nature of the country there are virtually no sheep in the headwater regions of the catchment. However, feral animals include rabbits, goats and red deer, the latter two being widely distributed.

The Shotover River is considered to be the most important source of suspended sediment and wash load in the whole Clutha catchment. The millions of yards of shingle that have been sluiced into the main bed, and through which the river is actively degrading, constitute the main source of this material.

Mr. F. L. Miller writes a most comprehensive concluding chapter on erosion, soil conservation and land capability. Most of the erosion is geological, due to altitude and the foliated mica-schists, but serious accelerated wind erosion occurs on the terrace faces and old sluicing dumps, especially where rabbits are abundant. In the areas that have been most intensively grazed, St. John's wort and sweet briar are the most abundant noxious weeds. The Polnoon Basin and adjacent tributary catchments have all been burned in the past, but with withdrawal of sheep since the mid-thirties, these areas provide good testimony of recovery to a dense and protective tussock cover. One interesting feature noted is the vigorous colonisation of the piles of unconsolidated debris from sluicing by both Douglas fir and larch, a pointer for the utilisation of similar areas in Otago.

The synthesis of the data on soils, erosion and vegetation is made on the Land Inventory Map, using a fractional combination of symbols. This provides the basis for the evaluation of the permanent potential of the land.

The seventy-two pages of the bulletin fill a small gap in the urgent need of a survey of the South Island high country. The indications of changes in the biota would have gained even more significance had a history of past management been available. The illustrations are clear and include four extensive panoramas of inaccessible country. The six maps are well-produced but lack a north line indication. One feels the co-operation of government and university specialists with catchment boards, as exemplified in this survey, could be extended more widely to both mutual and national benefit.

Further fieldwork has been completed on surveys of the Lower Shotover, Nevis and Arrow catchments. The publication of these bulletins is awaited with interest for it is by such means that a rational and integrated approach can be made to the management and utilisation of the high country.—D. HAMILTON.

THE NEW ZEALAND GEOGRAPHICAL SOCIETY

ADDRESSES FOR CORRESPONDENCE

Contributions for publication in the *New Zealand Geographer*, books and articles for review, and all correspondence on editorial matters should be addressed to:

The Editor, *New Zealand Geographer*,
Department of Geography,
University of Auckland,
Auckland, C.I., New Zealand.

All business correspondence, including subscriptions from overseas members and intending members, and libraries and institutions in New Zealand and abroad, should be addressed to:

The Secretary, New Zealand Geographical Society,
Department of Geography,
University of Canterbury
Christchurch, C.I., New Zealand.

All exchange publications, requests for the loan of books and periodicals, and all enquiries on library matters, including information on maps, should be addressed to:

The Librarian, New Zealand Geographical Society,
Department of Geography,
University of Auckland,
Auckland, C.I., New Zealand.

All cheques etc. should be made payable to the New Zealand Geographical Society (Inc.) and crossed.

TO CONTRIBUTORS

Members of the Society and subscribers to the *New Zealand Geographer* will have noticed that the journal does not always appear during the months of April and October. Every endeavour is made to publish the *New Zealand Geographer* in time, but the Editor is largely in the hands of contributors. The work of editing and publication would be greatly facilitated and expedited if the following points were noted:

1. All copy intended for publication should be in the hands of the Editor by the beginning of October for the April number, and by the beginning of May for the October number. Late copy can be accepted only in special circumstances. Alternatively, it may be held over.
2. Articles, notes, commentaries and reviews should be typed, double-spaced, on quarto paper.
3. Maps and diagrams must be drawn in indian ink and be ready for reduction. Their dimensions must be of a reasonable order and should not be more than three times the page size of the *New Zealand Geographer*.
4. Photographs must be printed for contrast on glossy paper.
5. As far as possible, contributors should follow in their footnotes, captions and lettering the established style of the journal.

NEW ZEALAND BOOKS

NEW ZEALAND: A REGIONAL VIEW

by K. B. CUMBERLAND AND J. W. FOX

A revision and expansion of the material presented in the Education Department's *Post-Primary School Bulletins* dealing with the regional geography of New Zealand. Each chapter has been re-written, and all the maps and many of the photographs are new. This presents for the first time within one cover a regional geography of New Zealand.

272 pages

Demy 8vo

In the press

A HISTORY OF CANTERBURY. VOL. 1: TO 1854

In this first volume of a work to be completed in three volumes, the history of the settlement of Canterbury in New Zealand is carried to 1854. Professor G. Jobberns provides an introductory geographical appreciation. Mr. C. R. Straubel traces the story of Maori and European in Canterbury up to the arrival of the Canterbury Association's settlers in 1850, and Professor L. C. Webb deals with the Canterbury Association and its settlement.

287 pages

Demy 8vo

Price 22s 6d

PRINTED AND PUBLISHED BY

WHITCOMBE AND TOMBS LIMITED

LANDFALL

A New Zealand Quarterly

LITERATURE . THEATRE

THE ARTS . POLITICS

ILLUSTRATIONS

LANDFALL is edited by CHARLES BRASCH

and published by

THE CAXTON PRESS

119 VICTORIA STREET, CHRISTCHURCH

Annual subscription 20s. net, post free